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ENGINEERING
NEWS-RECORD

DECEMBER 16, 1943

High Fills Carry Relocated Railway Through Tennessee Mountains

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Prestressed Concrete Pressure Pipe By a New Manufacturing Method

Prevention and Control of Cracks In Reinforced Concrete Structures

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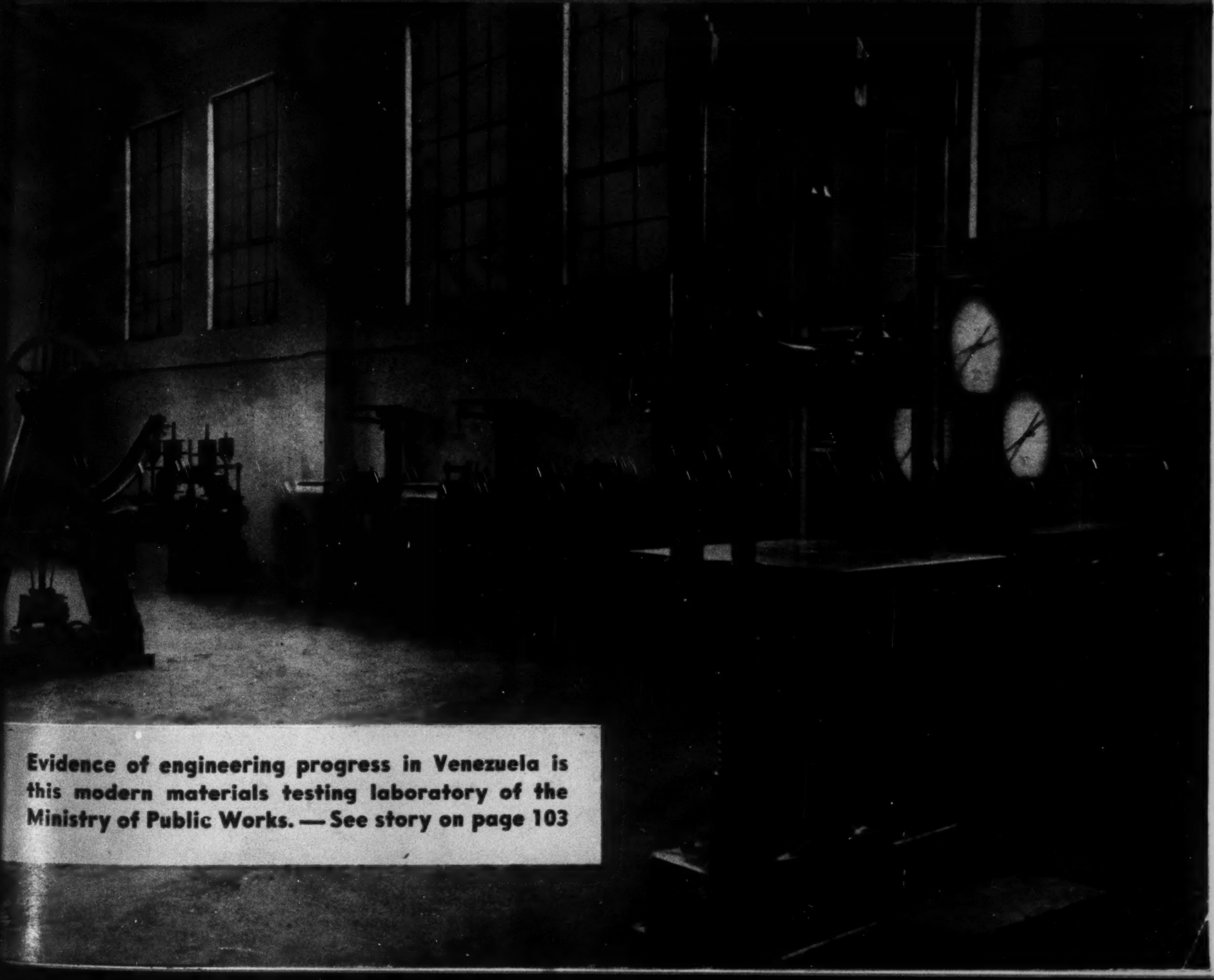
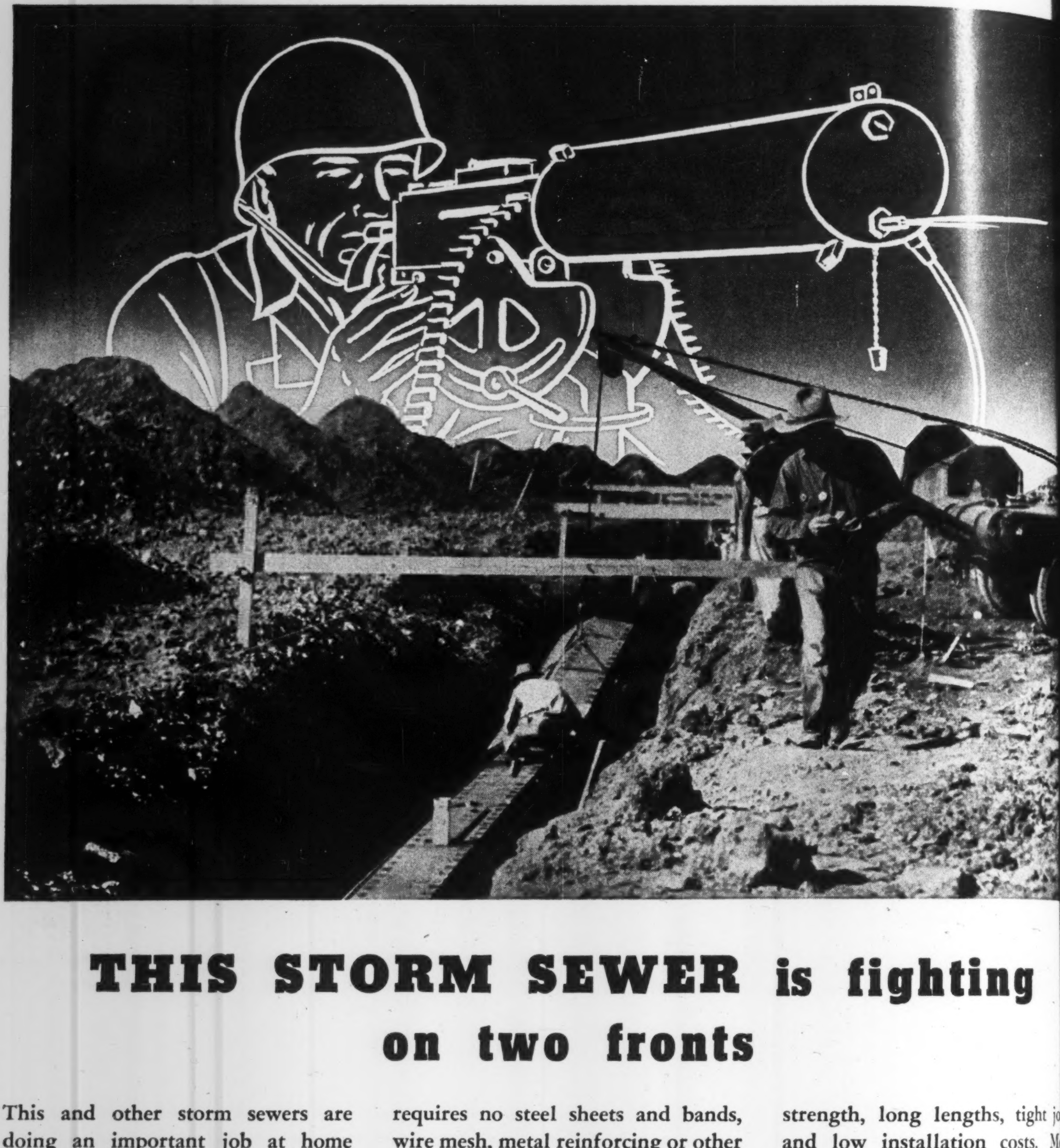
Ambiguous Words in Specifications Confuse Bidders and Increase Cost



Evidence of engineering progress in Venezuela is this modern materials testing laboratory of the Ministry of Public Works. — See story on page 103



THIS STORM SEWER is fighting on two fronts

This and other storm sewers are doing an important job at home without the use of critical materials—thanks to ARMCO Emergency Wood Pipe. The metal it releases may even now be helping to save lives and shorten the war on a distant fighting front.

Yes, essential wartime drainage can be taken care of economically, efficiently and *patriotically.* The new design of ARMCO Emergency Pipe requires no steel sheets and bands, wire mesh, metal reinforcing or other critical material. Skilled labor is not needed. The pipe is easy to handle and install. Also important now, ARMCO Pipe is light in weight and nestable, which often means up to 80 per cent savings in transportation.

Remember that ARMCO Corrugated Metal Pipe is only on temporary "leave of absence." It will be back after the war with its flexible strength, long lengths, tight jo
and low installation costs. M
while, steel must not be used in
drainage structure unless engineer
integrity demands it. For most
those wartime "must" jobs you'll
a highly practicable substitute
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ARMCO EMERGENCY PIPE

ENGINEERING NEWS-RECORD

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WALDO G. BOWMAN, *Editor* ALBERT E. PAXTON, *Manager*

Vol. 131 DECEMBER 16, 1943 No. 25

COMING NEXT

• On Attu's bleak, fog-enshrouded mountains U. S. Engineers built and fought their way through one of the toughest and bloodiest battles of this global war. First full account of the Engineer activities released for publication will be reported by H. W. Richardson, *ENR* western editor, in the Dec. 30 issue. Mr. Richardson has just recently returned from a visit to the Aleutian Islands interviewing Engineer officers who took part in the Attu invasion.

• One of the major war projects in Brazil is the development of the Itabira iron ore deposits in the Rio Doce valley. North American engineers and contractors are prominently identified with the work, which involves railroad rehabilitation, mining operations, port construction and environmental sanitation activities. The story of the project and the men who are working on this strategic behind-the-front area of supply will be told in *ENR* Dec. 30, by Edward J. Cleary, managing editor, who visited the work.

• Foundation requirements for a recent steam power generating station presented a difficult problem that taxed the ingenuity of the engineers and contractors. To solve the problem a variety of pile supports had to be used, including: 18 in. dia, open-end pipe as long as 152 ft.; cast-in-place concrete; composite; wood and closed-end pipe piles. Special construction procedure was adopted that proved not only economical, but enabled the contractors to deliver the job on schedule. The project will be described in the Dec. 30 issue.

LOOKING AHEAD

• In moving snow from miles of runways the Army's Corps of Engineers have developed new means and procedures for keeping airfields open for winter flying. Tests of equipment have been made on widely separated fields under varying conditions and recommendations made for machines and procedure best suited to different rates of snowfall. This material has been briefed for early presentation by assistant editor, Hal Hunt, whose previous article "Fighting Snow to Keep 'em Flying," was reproduced in quantity by the U. S. Government.

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REDUCE INSIDE "DIM-OUT" AREAS

Ease of seeing and illumination of *vertical* work surfaces like this are materially increased by a reflecting floor made with Atlas White cement.

Light reflected from below—by a floor made with Atlas White cement—reduces shadow areas and throws more useful light on the working surface. The results: improved seeing conditions, comfort and efficiency, and increased production.

Proof of the effectiveness of Light-Reflecting Floors in wartime installations points to the value of considering floors as a contributing factor in post-war lighting of plants and factories. In one bomber plant, lighting tests showed that a white cement floor reflected 20% more light to *vertical* surfaces than did an adjacent gray cement floor under the same lighting conditions—61% more to underwing surfaces.

Consider Light-Reflecting Floors for war and post-war construction or conversion. For complete information about them, write for our free 24-page booklet, "Light from Floors." Atlas White Bureau, Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Bldg., New York 17, N. Y.

HOW ABOUT MAINTENANCE?

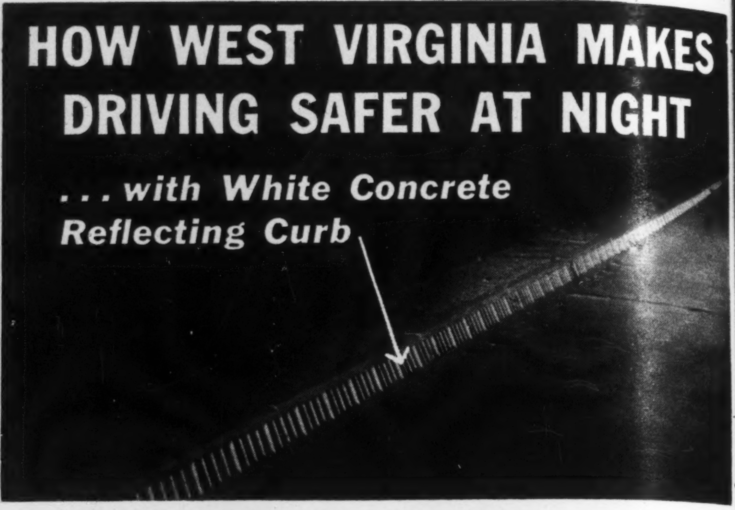
Experience shows white-cement floors are easy to clean, easy to keep clean, and retain their reflection advantage. Maintenance is simple—frequent sweeping, occasional damp mopping, periodic scrubbing.

ENR-F-24

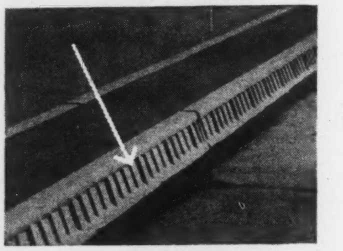
ATLAS
WHITE CEMENT
For Light-Reflecting Floors

HOW WEST VIRGINIA MAKES DRIVING SAFER AT NIGHT

... with White Concrete Reflecting Curb



Night view of the Upton Creek-C&O Underpass Road in Kanawha County, West Virginia, shows the effectiveness of White Concrete Reflecting Curb. Light shown comes from car headlights only. Marietta Concrete Corp., Marietta, Ohio, precast the curb, which was installed by Stellhorn & Beightler, Columbus, Ohio.



The white guide to safety on this West Virginia road is Concrete Reflecting Curb made with Atlas White cement. By day, its permanent whiteness makes it easy to see. By night, under car headlights alone, it becomes doubly effective in providing driving visibility because of its light color and its special saw-tooth surface.

With smooth curb, the headlight beams are reflected away from the driver. Visibility is low. But the scientifically designed projecting faces of White Concrete Reflecting Curb, shown in the illustration, catch headlight beams and reflect the rays directly back to the driver's eyes. The curb is clearly defined.

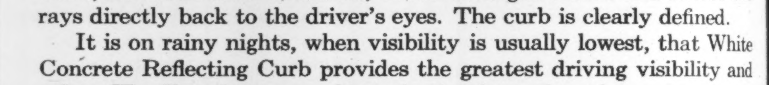
It is on rainy nights, when visibility is usually lowest, that White Concrete Reflecting Curb provides the greatest driving visibility and safety. The film of water on the projecting faces gives them even greater reflecting power. The driver's eyes receive more light from the curb for longer distances ahead.

Be sure you have complete information about Reflecting Curb against the time when roads must be modernized or new highways are laid out for tomorrow's post-war traffic. A booklet, "A White Guide to Safety," gives this information. Send for a free copy to: Atlas White Bureau, Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

ENR-R-4

A smooth curb (left) wastes light . . . reflects it up and away from the driver. A White Concrete Reflecting Curb (right) conserves light by reflecting it back to the driver. Hence, a smooth curb is barely visible, while a Reflecting Curb stands out as a gleaming white guide to safety.



ATLAS WHITE CEMENT
for white concrete reflecting curb

NGINEERING NEWS-RECORD • DECEMBER 16, 1943 • VOLUME 131 • NUMBER 25

New construction in 1944 estimated at $4 billion

Secretary of Labor reports big reduction probable in both public and private work. Military and naval construction likely to be little more than half that of 1943.

New construction expenditures in the ontinental United States are expected o drop from an estimated $7.4 billion n 1943 to approximately $4.2 billion in 944, Secretary of Labor Frances Perkins eported Dec. 11. "Construction for rivate account will decline from an stimated $1.6 billion in 1943 to $1.3 illion in 1944," she said. "Public contruction expenditures for 1944 are foreast at $2.9 billion as compared with a reliminary estimate of $5.7 billion in 943.

"Private construction expenditures ere lower in 1943 than in any year since 934 and, if the war continues through 944, will probably approach the level f the bottom depression year. Nonarm residential construction expendiures in 1944 will amount to approxiately $600 million as compared with 756 million in 1943. Practically all of his type of construction will be found n critical housing areas in war indusrial centers. As in 1943, privately fianced nonresidential construction is expected to consist largely of war plants and should not total more than $100 million as against $148 million in 1943. The outlook for farm construction at this time indicates that the total for 1944 will be about the same as in 1943. Public utility construction expenditures amounted to approximately $400 million in 1943 and the prospects are that they will not exceed $310 million in 1944.

Public construction estimate

"The size of the 1944 public construction program will be largely determined by the need for new industrial facilities and military and naval construction. At this time the outlook is that not more than $200 million will be spent for public war housing in 1944 as compared with expenditures of $628 million in 1943. Nonresidential construction expenditures, including those for industrial facilities financed from public funds are expected to total approximately $650 million in 1944. The preliminary estimate of these expenditures in 1943 is $1,737 million. Direct military and naval construction expenditures will probably amount to no more than $1,350 million in 1944, slightly more than half of the $2,474 million expended in 1943. There is still work to be done on the strategic network of highways and on access roads and flight strips. This work will maintain highway expenditures at a level not far below that of 1943 when expenditures totaled approximately $407 million. The total of all other Federal construction expenditures will probably not exceed $250 million in 1944 as compared with $391 million in 1943. State and local expenditures are expected to decline from about $110 million in 1943 to not more than $80 million in 1944."

• • •

***NEW CONSTRUCTION EXPENDITURES IN CONTINENTAL U. S. AS ESTIMATED BY U. S. DEPARTMENT OF LABOR**

(Millions of dollars)

	1944	1943
otal new construction	4,230	7,353
Private construction	1,310	1,606
Residential (nonfarm)	600	756
Nonresidential	100	148
Farm	300	302
Public utility	310	400
Public construction	2,920	5,747
Residential (war housing)	200	628
Nonresidential (includes industrial facilities)	650	1,737
Military and naval	1,350	2,474
Highway	390	407
Other public:		
Federal**	250	391
State and local***	80	110

* Preliminary, subject to revision. The estimates include expenditures for major additions and alteraons but not for maintenance.

** Includes conservation and development, TVA, and public pipeline construction expenditures.

*** Includes water supply, sewage disposal and miscellaneous public serviee enterprises

Construction decline will release many men

The current decline in construction will have released about half a million men for other employment by the end of 1943, the War Manpower Commission has predicted.

Since the wartime peak of 2,190,000 men in the fall of 1942, construction employment has fallen steadily until it reached about 1,066,000 in the same period of this year. Labor market information indicates that the decline will continue to about 600,000 or 700,000 in January, 1944, and to 500,000 or 600,000 in July, 1944. These estimated total employment figures for 1944 may be higher since some projects are behind schedule and there is also a possibility that layoffs on many of them are being postponed by reduction of long work-weeks. However, the decline is inevitable even if its full impact is delayed.

Between July and November of this year more than half of 267,000 construction workers released were in areas of acute labor shortages, thereby facilitating their rapid reabsorption into industry. In addition, approximately 19,000 workers were released in areas anticipating a labor shortage, where the demand for male labor was strong.

In areas where the labor supply is adequate the War Manpower Commission is recruiting displaced construction workers for transfer. Unskilled construction workers are readily absorbed in a large number of war industries where the need for their labor is urgent.

License law for District of Columbia sets up new engineer classifications

Attempt made in proposed law to separate "professional engineers" untainted by commercialism from "engineers" who will not swear to keep their work free from any commercial connections

A bill to regulate the practice of professional engineering in the District of Columbia has been introduced into Congress (S.1562) which makes a distinction between engineers licensed under the act that is new in the long record of acts to control the practice of engineering. Section 15 of the proposed act states:

"Before the board shall issue a professional engineer's certificate of license to an applicant, he shall be required to certify under oath that he will receive no profit from the subject matter of his professional employment other than his salary or charges for professional services rendered; and that he will not have any substantial financial interest in, nor render other than purely technical services to, any concern providing or handling materials or products covered by his design. Upon request of any person refusing to take the above oath, the board shall issue a license, provided the applicant has fulfilled all the other requirements of this act, authorizing him to practice in a branch or branches of engineering but omitting the term 'professional'; and such license shall qualify him for practice as provided for by this act, with the same rights as the holder of a professional engineer's license, and shall subject him to all the requirements and penalties of this act, the same as a holder of a professional engineer's license.".

The purpose of this peculiar distinction is not clear, but it is understood to be an attempt to find a compromise that would be satisfactory to certain speculative building interests in Washington who have long opposed passage of a professional engineer's license law in the District of Columbia.

Many exemptions

The proposed law is very limited in its application because of its many exemptions. In addition to the normal exemption for legally qualified persons from outside the district offering to practice for a limited period, the act exempts consulting engineers, officers and employees of the federal government or of the District of Columbia "while engaged solely in the practice of the profession of engineering for said government," engineering employees of corporations engaged in interstate commerce if such corporation is subject to regulation by the Interstate Commerce Commission or the Federal Communications Commission and similar employees of public utilities subject to regulation by the Public Utilities Commission of the district, except those furnishing "advisory service to the public in connection with engineering matters." Registered architects are also exempt and persons "making plans, specifications for or supervising the erection, enlargement or alteration of buildings" when the cost of completed structure is less than $30,000. Engineering on buildings costing less than $5,000 is exempt, as is the work of mining engineers, patent attorneys and insurance inspectors.

Restricted practice

The type of engineering practiced by licensees is restricted by a provision that the "certificate shall authorize the practice of engineering only in the branch or branches of engineering in which the applicant has shown proper qualification and shall include the term 'professional' only when the requirements of Section 15 have been fulfilled."

The "grandfather clause" is limited to one year after passage of the act except that employees of the federal government or the District of Columbia can obtain a license at any time without examination.

• • •

Bonneville Dam completed and activated Dec. 14

On Dec. 14, the governors of the Pacific Northwest states and other leading public officials participated in a program held in the assembly bay of the power-house at Bonneville Dam, on the Columbia River Highway, 40 miles east of Portland, marking the installation of the tenth and final power unit.

The ceremonies signalizing the completion of the entire Bonneville project were conducted by the Portland District, Corps of Engineers.

• • •

Rezoning to help housing in Minneapolis—St. Paul

On Dec. 2, the Minneapolis, Minn., Post War Planning Committee authorized the city planning commission to resurvey the city's zoning problem preliminary to the development of a postwar public and private building program. It was the first definite move towards modernizing the present zoning system, as suggested by architects, and by city, state and government agencies.

Minneapolis, St. Paul, and their surrounding towns will undertake to pr vide more homes for families throug conversion of large houses where it fi in with the zoning. Both cities have man large homes in areas zoned for comme cial and apartment house uses which ca be remodeled for more families, and it i the intention of the FHA to arrange fo priorities for the material for such re modeling where it will not hurt propert values and living conditions through un controlled conversion in the name of th war effort.

• • •

Canada removes ban on asphalt for road use

Restrictions upon the sale of asphal and bituminous products for road use i Canada have been cancelled. Control had been exercised by the Department o Munitions and Supply over all such products in view of prior demands for wa use. No priorities are now necessary t obtain these materials for ordinary use and this is taken to be an indication tha airport runway construction in Canad is now so far advanced that paving materials are available in excess of suc wartime requirements.

• • •

Stanton Walker to head highway research work

Stanton Walker, director of engineerin of the National Sand and Gravel Association, Washington D. C., was electe chairman of th Highway Researc Board at the board' annual meeting i Chicago, Nov. 27 30, to succeed F. C Lang, engineer o materials and research, Minnesot Department o Highways, and professor of highway engineering at the University of Minnesota Roger L. Morrison, professor of highwa engineering at the University of Michiga was elected vice chairman of the board and J. S. Williamson, chief engineer o the South Carolina Highway Commission was named a new member of the executive committee.

Mr. Stanton is a graduate of the University of Illinois and served with th Portland Cement Assn. as a research engineer from graduation in 1917 to 192 Since 1926 he has been with the Nationa Sand and Gravel Assn. He also is director of engineering for the National Read Mixed Concrete Assn. and consulting engineer to the National Industrial San Assn.

More data on concrete dome building collapse

Additional information concerning the collapse of the balloon-like concrete building on Nov. 18 (ENR, Dec. 2, p. 793) has been received from our Los Angeles correspondent, as follows:

The largest structure of its kind ever attempted, a 100-foot diameter concrete dome building 32 feet in height under construction in Los Angeles collapsed for the second time recently during the preliminary stages of erection.

Designed to conserve critical materials and manpower owing to the simplicity of construction, the dome is made of gunite placed over a balloon-like type form which consists of an airproofed cotton fabric bag inflated under pressure supplied by rotary blowers. The first coat of gunite is placed in ¼-inch layers in five to six foot high rings completely surrounding the form, each ring being built up to a 1 to 1¼ inch thickness before the guniting of the next ring is commenced. The gunite for this initial 1-inch shell is a special preparation designed to have "flash" setting characteristics as well as great strength and a minimum of expansion and contraction.

After the initial shell hardens, the bag is deflated, reinforcement placed and additional layers of gunite and insulating material added until the dome is of the required thickness. Reinforcement is not needed on buildings under 50 feet in diameter. Door and window assemblies are installed against the form before placing the concrete and are included as an integral part of the structure. The dome, circular in plan and semi-elliptical in elevation, possesses great strength by reason of its shape.

Too much pressure

The erection of the structure was well under way with a good portion of the first coat of gunite placed when the first collapse occurred. The principal cause of the failure was due to the inability of the balloon form to withstand a pressure greater than ½ ounce per sq. in. whereas the design loads were determined to be 1½ ounces per sq. in. The secondary cause was due to the effect of temperature and humidity upon the quick setting characteristics of the gunite, more weight being placed on the form than was realized. The first failure caused a temporary delay of two days while repairs were made to the balloon form.

Construction was continued after the bag had been patched until, five days after the first failure, 80 per cent of the first coat of gunite had been placed. At that time, the one blower which was operating (three blowers were on the job) ceased to function, allowing the pressure to drop to ¼ ounce per sq. in. before the other blowers could be brought into action. This drop in pressure is believed to have caused cracking in the green concrete which led to a complete collapse of the structure within a very short while. Fortunately, no one was injured during the collapse although between 15 and 20 men were working on the scaffolding which, although shaken violently, remained upright.

Fabrication of a stronger bag is at present under way and construction will begin immediately upon completion of the form. It is anticipated that the building will be completed about the first of January.

About fifteen 30-foot diameter buildings have been constructed in this manner and are performing satisfactorily. A full scale load test performed on one of the 30-foot structures indicated the building to be capable of supporting a load of approximately 40,000 pounds spread over approximately one-half of the horizontal projection of the building. Plans are under way for structures of this type up to 200 feet in diameter.

Architect Wallace Neff of Los Angeles is the inventor of the "balloon type" of construction and Clarence Stacy is the structural engineer on this project. Haddock Construction Company, which possesses exclusive construction rights for the type of structure, are the contractors with C. C. Alley as superintendent. Charles Dutro Associates are doing the gunite work.

• • •

J. S. Watkins new head of Kentucky highways

J. S. Watkins has been appointed commissioner of highways in Kentucky by Governor Simeon S. Willis. Watkins has been engaged extensively as a consulting engineer since 1933. Since the war started, his firm has designed and supervised such projects as Camp Campbell, the Lexington Signal Depot at Avon, Ky., and extension of the pilot replacement center, Maxwell Field, Alabama.

Watkins was executive project manager in charge of design and construction of Camp Campbell near Hopkinsville, said to be one of the largest cantonment projects ever constructed by the War Department.

• • •

Perring named engineer for Baltimore harbor

Henry G. Perring has been appointed harbor engineer, and as such is head of the Bureau of Harbors of the Department of Public Works, Baltimore, Md.

Mr. Perring is a member of the firm of Perring and Remington, consulting engineers, which has designed a number of structures that will now come under his continued jurisdiction.

Contract is signed for Leadville tunnel

Secretary of the Interior Harold L. Ickes, on Dec. 5, announced the signing of a government contract for driving a 17,300-ft. drainage tunnel to unwater flooded metal resources in the Leadville, Colo. zinc-lead area. This is believed to be the first time the government has ever undertaken a project of this kind. It is to be financed with a sum of $1,400,000 appropriated by Congress to the Bureau of Mines to cover all costs of the project.

The fixed-fee contract was awarded to Stiers Brothers Construction Co., drivers of several Colorado railroad, irrigation, mining, and drainage tunnels, and provides for the government's right either to alter plans or to halt construction. Work is to be started within 30 days, with an estimated minimum of 555 days required for construction.

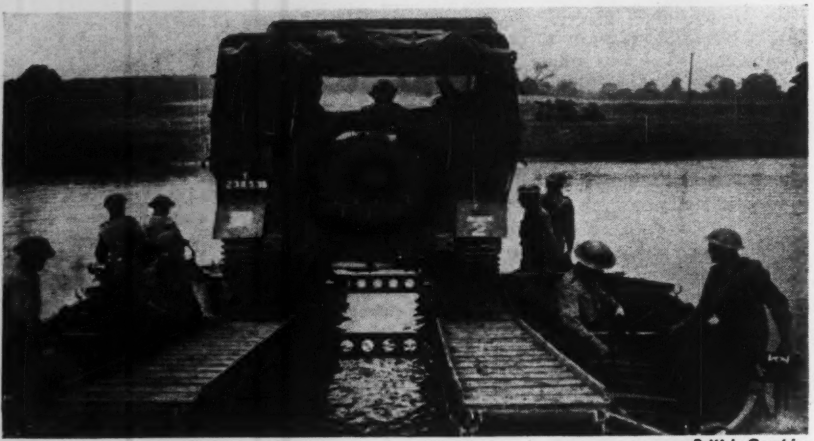
According to present plans a main tunnel will extend from the vicinity of the East Fork of the Arkansas River to the Pyrenees Shaft, one of the many flooded mines in the area. A lateral is contemplated from the Pyrenees Shaft to the Tucson Shaft, another flooded mine. A second lateral will branch from the main tunnel to the Penrose Shaft, also flooded. It is proposed to use the tunnel for prospecting as well as for drainage.

Secretary Ickes pointed out, in commenting on the project, that "No single mine operator has attempted such a drainage project for his own property since such an undertaking necessarily would involve the expenditure of large sums of money. Because of the geological structure of the Leadville region, no single mine operator can drain his property without, in turn, draining other properties."

The Department of the Interior has begun negotiations with property owners for the collection of royalties of minerals produced from the unwatered mines, which will go toward defraying costs of construction and operation of the tunnel. It is estimated that three million tons of zinc and lead ores, and one million tons of manganese ores are now under water in the Leadville region where operators have fought floods for half a century. Areas included in the flooded region are Carbonate Hill, Downtown, Fryer Hill, and Iron Hill.

◆

The War Department has announced authorization for construction at Laguna Madre Sub-Post of Harlingen Army Airfield, Texas, to cost $592,670. Work is to be supervised by the Galveston, Texas, District Office of the Corps of Engineers, and consists of additional housing, parking apron and extension of runways and taxiways.



British Combine

Equipment ferried on floating bridge unit

British engineers have developed a quick way to get a limited number of pieces of army equipment across a stream where bridges have been destroyed. Instead of building a complete pontoon bridge, one unit of such a bridge is assembled, using sections of runways as ramps, and individual pieces of equipment are ferried. Outboard motors propel the folding boats.

Classifications adopted for postwar projects

In an effort to set up some standard way for indicating the stage of progress that has been made on postwar projects, the committee on postwar construction of the American Society of Civil Engineers has adopted the following standard designations for reporting such projects. Use of these designations is recommended to all agencies making postwar plans or compiling records of progress in such planning.

Stage I—Idea Stage

> Projects in this category are those known by name and description only, which are being visualized by various proponents or are pictured in the form of sketches, but on which no basic engineering studies have been made.

Stage II—Report Stage

> These are projects which have crystallized to a point where an engineering report is being or has been prepared covering scope and need of the project, general layout, preliminary estimate of cost, and similar data.

Stage III—Design Stage

> This covers specific projects for which complete surveys, borings, soundings, etc., are being made, land acquisition maps are being prepared, and on which plans, specifications and contract documents are in process of preparation, such as are required as a basis for securing bids.

Stage IV—Completed Plans Stage

> This covers projects on which plans, specifications and contract documents have been completed and laid aside to be used at the opportune time for securing firm bids.

Stage V—Bidding Stage

> This includes all projects on which plans, specifications and contract documents for bidding have been completed, all necessary rights-of-way have been secured, and the necessary funds have been authorized and allocated by proper authorities.

For purposes of tabulation and subdividing the various classifications of work, when so desired, it is recommended that the following subdivisions be used:

1. Highways
2. Bridges
3. Railroads and terminals, rapid transit systems, subways
4. Airports, terminals and landing strips
5. Pipe lines, oil and gas
6. Power generating and transmission systems
7. Municipal improvements (streets, sewers, water supplies, parks, etc.)
8. Public buildings, schools and hospitals
9. Commercial and industrial buildings
10. Housing
11. Waterway improvements (dams, docks, locks, port, harbor and channel).
12. Flood control, irrigation, drainage, and reclamation
13. Military projects
14. Foreign projects

The A.S.C.E. committee on postwar construction was established in June of this year (*ENR*, June 24, p. 922). It consists of G. Donald Kennedy, chairman, Washington, D. C., A. J. Ackerman, Dean G. Edwards, Frederick H. Fowler, Gustav J. Requardt and Frank T. Sheets. Hal H. Hale, Washington representative of the A.S.C.E., is acting as secretary.

Hoskins elevated to new Public Health post

J. K. Hoskins, for several years chief of the sanitation section of the U. S. Public Health Service, has been appointed an assistant surgeon general in charge of a newly created division of sanitary engineering. His new assignment, which carries with it the relative rank of brigadier general, follows a recent reorganization of the Public Health Service, to amalgamate the functions of a number of bureaus.

To his new post Mr. Hoskins brings the experience gained in 29 years of activity with the Public Health Service. Much of his work has been in connection with stream pollution studies, and for many years he was in charge of the investigations on the Ohio River from which emanated important contributions on pollution degradation and recovery phenomena in waterways.

During the last war, Mr. Hoskins was in charge of extra-cantonment zone sanitation activities at a number of camps. Prior to his association with the Public Health Service in 1914 he worked with several consulting engineering firms on the construction of municipal water and sewerage facilities. A graduate engineer of Pennsylvania State College, Mr. Hoskins also received additional training at the University of Berlin.

• • •

D.P.C. halts big steel mill at Geneva, Utah

The Defense Plant Corporation said Dec. 9 that it has notified the Geneva Steel Company to halt construction on the structural steel mill at their works at Geneva, Utah. The action was taken because the War Production Board reported ample capacity for structural steel was now available.

This mill was part of a project estimated to cost $126 million.

• • •

Bridge job won on the toss of a coin

Faced with two identical bids of $10,800, out of a total of five, on a contract for underpinning two piers of the Vineland Ave. Bridge over the Middle Tujunga Wash in Los Angeles, Calif., the Board of Public Works on Nov. 16 awarded it to Obert Bros. on the toss of a coin by President James Wilson.

The other low bidder was Norman I. Fidel. Both agreed to the method of selection which has been used before where there have been identical low bids. The job is to be financed from gasoline tax funds.

Engineer faculty news and changes

J. Gardner Bennett, engineering instructor at Robert College, Istanbul, Turkey, for the past three years, recently accepted an appointment as associate professor of civil engineering at the University of Wyoming. A native of Iowa, Mr. Bennett graduated in engineering from Cornell College in 1912. The University of Wisconsin conferred a B.S. degree on him in 1918, which was followed by a C.E. degree in 1925. His background of engineering experience includes highway bridge designing, and municipal and public works construction. Mr. Bennett was head of the civil engineering department, Lewis Institute, Chicago, for 12 years prior to going to Turkey.

Dr. Francis P. Witmer, who recently retired as professor and director of civil engineering at the University of Pennsylvania, was honored Dec. 3 by the Engineering Alumni Society of the school. The group gave Dr. Witmer a scroll in recognition of his many years of "loyal and distinguished service." George W. McClelland, provost of the university, made the presentation.

Frederick L. Gerke, former instructor in the civil engineering department at Kansas State college, has become an ensign in the naval air corps and has been located at Naval Air Station, Franklin, Va. He was a 1936 civil engineering graduate of Iowa State College.

Russell S. Poor, who has been administrative assistant at Birmingham-Southern College for a long time, has been appointed dean of the graduate school and director of the research council at Alabama Polytechnic Institute, Auburn, Ala.

The retirement next March 1 of William D. Ennis, as Humphreys Professor of Engineering Economics at Stevens Institute of Technology, Hoboken, N. J., was announced Dec. 5. Professor Ennis was graduated from Stevens with the class of 1897 and received from his alma mater the honorary degree of Doctor of Engineering in 1934. His approximately fifty years of engineering have been about equally divided between professional employment and private practice, on the one hand, and college teaching on the other.

His war service in the first World War was as chief engineering officer at the Watervliet Arsenal. Later, he served as technical advisor to the War Department Claims Board at Washington. Following this, he was one of the founders, with Campbell Scott, E. P. Goodrich and the late George B. Ford, of the Technical Advisory Corporation of New York. This firm carried on a variety of engineering work.

Non-political road board appointed for California

Recently Governor Warren appointed California's new seven-man highway commission set up by the 1943 legislature in an effort to remove the state highway program as far as possible beyond the reach of political influence.

Under the new law, the seven-man commission will replace the old five-member board, with public works director Charles H. Purcell serving as ex-officio member and chairman.

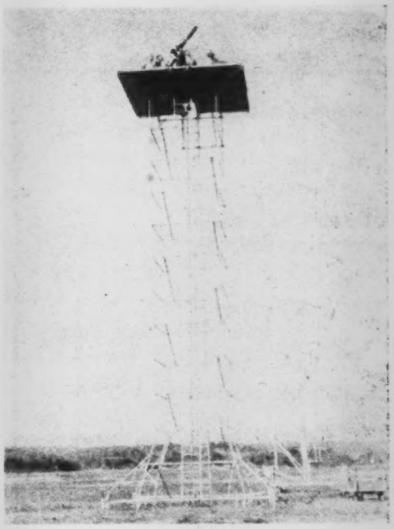
The other commissioners named are: Homer P. Brown, Placerville manufacturer, chairman of the state chamber of commerce, Sacramento district industrial committee, and director of the Mother Lode Highway Association; Chester Warlow, Fresno banker and civic leader long prominent in San Joaquin Valley highway and water affairs and National Parks Highway Association activities; Walter Sandelin, Ukiah hotel man, past president of the Ukiah Chamber of Commerce and Redwood Empire Association member; A. Arnholt Smith, San Diego banker and manufacturer; James Guthrie, San Bernardino publisher; and Harrison Baker, Pasadena real estate man and chairman of the Pasadena planning commission.

• • •

Large new airport proposed for Toronto, Ont.

Toronto is almost certain to have a third airport, dwarfing the existing Island and Malton airports completely, according to Mayor F. J. Conboy on his recent return from a visit to Ottawa, where he had interviews with Transport Minister Michaud and Munitions Minister Howe of the federal government.

The new airport would be a postwar project, with runways at least 10,000 ft. long. It would be built in view of the strategic position of Toronto in relation to main air traffic routes. At present the city is served by an airport on Toronto Island, adjacent to the center of the city —but restricted in use because of high buildings and other obstructions—and by the large Malton airport, located seventeen miles from the center of the city.



Official U. S. Navy photo

Marines' observation tower

Pictured above is a 50-caliber machine gun being mounted on a 75-ft. "hasty erection tower" in a demonstration at the U. S. Marine Corps Air Station at Quantico, Va. The high stand is planned for hangar maintenance, gun platforms, and observation, the lower heights for work stands. The tower can be extended to a height of 75 ft. in 1½ hours by a crew of three. The gun platform is then drawn up on ropes. It can sustain a weight of 2,500 lb. The stand is the property of the Aviation Equipment Co., Tonawanda, N. Y.

Survey of postwar work started in Wisconsin

With a $25,000,000 postwar state building program already worked out by a Wisconsin legislative committee, a survey has been started recently of buildings and improvements needed by local governmental units.

Alfred R. Ludvigsen, secretary of the committee, has dispatched a questionnaire to cities, counties, villages and towns for estimates on public works which may be started at the end of the war. These local units are to report plans to the state planning board at Madison. The questionnaire asks for detailed information on public buildings, schools, public utilities, roads and streets, parks, airports and other improvements.

Estimates are to include cost without land, cost of land to be acquired, methods of financing, money available and status of work planned. Proposed methods of financing will show whether the projects are to be built by direct tax, general obligation bonds, special assessments or revenue bonds.

The committee hopes to include these postwar plans in its report to the state legislature, which convenes Jan. 12.

JOBS OF THE WEEK

HOSPITAL, Dublin, Ga.

Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded a contract for the construction of central buildings at Naval Hospital, to Hardaway Contracting Co., Columbus, Ga. at $1,696,000. Robert & Co., Inc., Atlanta, Ga., are the engineers.

DWELLINGS, Dallas, Tex.

A. P. Simons, Dallas, Tex., will construct by force account 200 one-story dwellings, Davis St., west of Kessler Blvd. The estimated cost is $1,000,000.

WHARF, Sydney, N. S.

Department for National Defense (Sea), Ottawa, Ont., awarded a contract to the Dominion Construction Corp., Ltd., Toronto, Ont., at an estimated cost of $500,000.

GASOLINE PLANT, Borger, Tex.

L. O. Stocker Co., Borger, Tex., will build 100-octane gasoline plant for Phillips Petroleum Co., Oklahoma City, Okla. The estimated cost is $850,000.

DWELLINGS, San Diego, Calif.

Public Housing Authority, San Diego, Calif., awarded a contract for 600 temporary dwellings to Gorelnik Co., Los Angeles, Calif., at $1,283,534.

DWELLINGS, Burbank and North Hollywood, Calif.

Jane Reed Kissinger, North Hollywood, will construct by her own forces 183 dwelling units in Burbank and 87 single dwellings in North Hollywood to cost in excess of $500,000.

DRAINAGE TUNNEL, Leadville, Colo.

Bureau of Mines, Denver, Colo., awarded a contract for 17,300 ft. drainage tunnel to unwater mines to Stiers Brothers Construction Co., St. Louis, Mo. The estimated cost is $1,400,000.

HOUSING, Galveston, Tex.

Robert E. McKee, El Paso, Tex., has been awarded a contract by Public Housing Authority, Fort Worth, for 600 housing units to cost $1,225,000. Rustay, Stone & Finger, Houston, are the architects.

HOUSING, New Orleans, La.

Public Housing Authority, Fort Worth, Tex., awarded a contract for 500 housing units to R. P. Farnsworth, New Orleans, La., at $663,132. Fromberg Associates, New Orleans, are the architects.

PIPE LINE, Louisiana

United Gas Pipe Line Co., Shreveport, La., awarded a contract to build oil pipe line to Whitaker Pipe Line Co., Ltd., Fort Worth, Tex. The estimated cost is $873,805. W. P. Poor is the supervising engineer for owner.

HOSPITAL, Waco, Tex.

Veterans Administration, Washington, D. C., awarded a contract for veterans hospital to Robert E. McKee, El Paso, at $1,483,000.

PREFABRICATED BUILDINGS, Dallas, Tex.

Smaller War Plants Corp., Dallas, Tex., awarded a contract for furnishing prefabricated buildings to National Housing Co., Dallas, Tex., at $1,241,000.

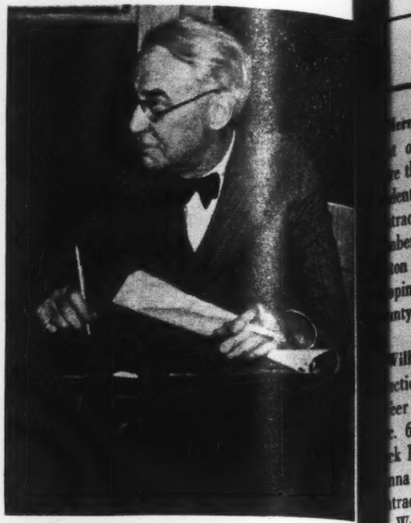
PLANT, Drummondville, Que.

Stewart Construction Co., Ltd., Sherbrooke, has been awarded a contract for 4-story, 75x150 ft. and 1-story, 157x294 ft. plant buildings by Canadian Celanese Ltd., Drummondville. The estimated cost is $500,000. D. Deshales, care of owner, is the architect and J. H. Killoran, care of the owner, is the engineer.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 74.

Surplus Army trucks now offered for sale

An advance announcement has been made of a plan to put on the open market about 10,000 trucks belonging to the War Department. Those that are in serviceable condition will be classified as surplus and sold by the Procurement Division of the Treasury. Unserviceable items, which it is believed are good only for scrap, will be sold by the salvage offices at Army camps and stations, under approval of the Motor Transport Division of the Army Ordnance Department at Detroit.



Harold K. Ferguson dies, industrial constructor

Harold K. Ferguson, 60, president of the widely known industrial building firm bearing his name, died in Cleveland, Ohio, Dec. 9. Mr. Ferguson's company built factories and other industrial structures in Canada, Mexico, Japan and China, as well as in the United States.

Mr. Ferguson was born in Albion, Mich., and obtained his B. S. degree at Ohio Wesleyan University in 1905. He first went to work as a timekeeper and estimator for the Austin Company, industrial builders, of Cleveland. He left after two years to join the signal department of the Santa Fe Railroad, rose to be an assistant signal engineer, then joined the General Electric Company as a commercial engineer.

In 1912 he returned to Cleveland as secretary of the Austin Company, and in 1918 formed his own firm.

During his connection with the Austin Company, Mr. Ferguson developed the "standard factory" principle of building, which was later to find wide usage. It provided for construction from stock plans with prefabricated structural steel, and proved to be one of the early bottleneck-breaking systems.

Another of his innovations was known as "the one-contract method" of designing, building and equipping plants through a single organization.

◆

Chile's Development Corporation has formulated an 18-year electrification program which will use hydro-electric power sources from Arica in the north to Magallanes in the south. The $100,000,000 project, on which work is scheduled to be started next year, will have an estimated output of 6,000,000 watts.

OBITUARY

errill Donaldson Knight, 83, resi-
of Montgomery County Md., for
e than 70 years, and former superin-
dent of county roads, died Dec. 7. A
tractor, Mr. Knight constructed a
ber of avenues in Northwest Wash-
on and later was instrumental in de-
ping the road system in Montgomery
nty.

illiam K. McFarlin, 83, railway con-
ction contractor and former chief en-
eer of the Lackawanna railroad, died
. 6. He was chief engineer of the
k Island before he joined the Lacka-
nna in 1899. In 1905 he became a
tractor and helped develop roads in
West and in Canada. In partnership
h Frank D. Hyde, he elevated the
kawanna railroad in Essex County,
J.

lbert Vincent Sweeney, 35, partner in
Butcher-Sweeney Construction Co. of
t Worth, Tex., died Nov. 26.

ike Brennan, 94, railroad contractor,
d at Houston, Tex., Dec. 2. Mr. Bren-
did pioneer railroad construction
k in the North and West. Later he
ped built the Santa Fe and Southern
ific lines in Texas.

illiam Rollin Gallagher, 63, retired
l engineer, died recently in Los An-
es, Calif.

eorge G. Wickline, 60, of Austin,
., chief bridge engineer of the Texas
hway department, died Nov. 27. He
ved as bridge engineer for the counties
McLennan and Dallas and joined the
hway department in 1918. He super-
d the building of most of the impor-
t bridges in Texas, among them the
750,000 bridge over the Sabine-Neches
terway at Port Arthur.

ohn Harrison Edelman, 81, construc-
engineer, died in Kansas City, Mo.,
v. 28. In his early days, Mr. Edelman
s associated with his father, also a
lder, in many Westport Landing proj-
s. Later he was associated with the
elman-Fleming Construction Co. His
erected many buildings in Kansas
y.

rthur Newell French, 87, former su-
intendent of the municipal water sys-
s at Seneca Falls, N. Y., and Hyde
k, Mass., died Nov. 27. He was born
North Clarendon, Vt., and retired in
1.

illiam E. Chantler, 54, long a build-
contractor at Boston, Mass., and for the past four years with the Boston Housing Authority, died at Braintree, Mass., on Nov. 27.

Robert D. Lengacher, 75, an employee of the water pipe extension department, Chicago, for the past 35 years, died Nov. 25.

William V. McDevit, 60, civil engineer, died Nov. 27. He had worked on many engineering projects in upper New York and in Connecticut.

Joseph E. Cahill, 71, superintendent of construction for Boston, Mass., from 1930 until 1941, died there Nov. 29.

S. A. Starkey, 69, former contractor and city commissioner of Houston, Tex., died Nov. 30. Mr. Starkey was a member of Smith, Starkey & James, road contractors, and Smith, Starkey & Brown, which firms helped build Houston and Texas roads, highways and bridges. He served Houston for ten years as street and bridge commissioner and chairman of the public works department.

J. S. Lemmond, 92, Charlotte, N. C., died Nov. 28. He was formerly chief engineer of maintenance for the Southern Railway.

Fred W. Ricketts, 55, landscape engineer of Fayetteville, N. C., died Nov. 28.

Herman Van Den Hoogen, 68, retired building contractor, died Nov. 27 in Hanford, Calif.

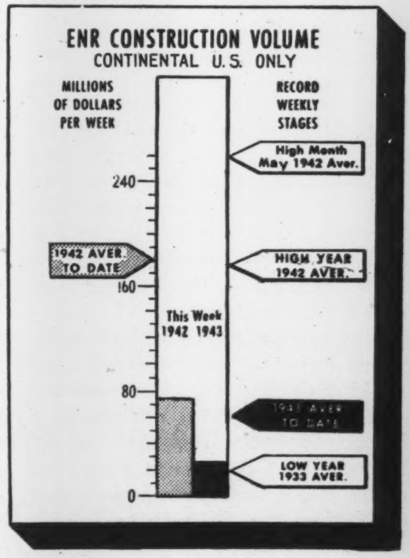
News of the Week
Continued on p. 132

CONTRACTS AND CAPITAL

CIVIL ENGINEERING construction volume in continental U. S. totals $26,792,000 for the week. This volume, not including the construction by military engineers abroad, American contracts outside the country, and shipbuilding, is 23 percent lower than in the preceding week, and is 65 percent below the total for the corresponding 1942 week.

Public construction tops last week by 15 percent, but is down 71 percent compared with last year. Private work declines 66 percent from a week ago, but climbs 81 percent over a year ago.

The current week's construction brings 1943 volume to $2,999,009,000, an average of $59,980,000 for each of the 50 weeks of the period. On the weekly average basis, 1943 construction is 67 percent under the $9,196,157,000 for the 51-week period in 1942. Private construction, $479,646,000, is 11 percent lower than a year ago, and public construction, $2,519,363,000, is down 70 percent when adjusted for the difference in the number of weeks.



In the classified construction groups, gains over last week are in sewerage, public buildings, and earthwork and drainage. Increases over the 1942 week are in bridges, industrial and commercial buildings, and earthwork and drainage.

New capital for construction purposes for the week totals $1,185,000, and is made up of $685,000 in state and municipal bond sales, and $500,000 in RFC loans for public improvements. The new financing total for the 50 weeks of 1943, $3,068,468,000, is 69 percent below the $10,214,049,000 reported for the 51-week 1942 period.

CONTRACTS

Continental U. S. Only
(Thousands of dollars)

	Week Ending Dec. 17 1942	 Dec. 9 1943	 Dec. 16 1943
Federal	$69,786	$17,263	$19,024
State & Municipal	2,668	1,209	2,188
Total public..	$72,454	$18,472	$21,212
Total private.	3,085	16,180	5,580
TOTAL	$75,539	$34,652	$26,792

Cumulative
1943......(50 weeks)......$2,999,009
1942......(51 weeks)......$9,196,157

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1942 51 weeks	 1943 50 weeks
NON-FEDERAL ..	$634,863	$314,630
Corp. Securities.	182,729	22,228
State & Mun...	211,979	126,224
R.F.C. loans ...	157,455	15,045
FPHA loans....	....	3,133
R.E.A. loans....	....	20,000
Fed.-Aid Hwy...	82,700	128,000
FEDERAL	$9,579,186	$2,753,838
TOTAL CAPITAL..	$10,214,049	$3,068,468

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost...	Dec. '43	294.51	141.57
Building Cost.......	Dec. '43	231.49	125.14
Volume	Nov. '43	149	65

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Suspension Bridge Stability

Sir—In discussing the effect of a shallow rectangular cross sectional shape of the suspended structure on the stability of a suspension bridge against aerodynamic action, Homer M. Hadley refers to the favorable results obtained in the laboratory investigations made with 100 ft. long models of the Tacoma Narrows Bridge (*ENR*, Nov. 4, 1943, p. 664).

Evidence concerning the favorable effect of shallow rectangular suspended deck structures on wind stability can also be found in the behavior of built suspension bridges. When the first wind movements of the Bronx-Whitestone Bridge were observed early in 1939, the writer began a systematic study of built suspension bridges to correlate their dimensional properties and their behavior due to wind action. The dimensional properties were expressed by three parameters, characteristic for the stiffness of the cable, the stiffness of the girder, and for the stiffening of the cable by the girder. In the expression of the latter parameter of a bridge, which was assumed to represent the limit of satisfactory wind behavior, the span length was taken to be variable, and so a parabolic criterion of stability was obtained.

A criterion derived from the properties mentioned contains the airflow characteristics of the assumed basic structure, and indicates for another structure only the corresponding amount of structural damping in the form of a requirement for the moment of inertia of the girders.

Among the 53 bridges investigated the plots of those that posses satisfactory resistance to aerodynamic action were near or below this stability criterion curve, while the plots of those which exhibited undesirable movements were very considerably above this curve, nearly proportional to the character of their oscillations. There are four bridges, however, whose stability could not be explained by the relative location of their plotted values. These bridges have practically unstiffened cables and deck suspended structures of shallow rectangular cross section, the airflow properties or aerodynamic damping of which is most likely the cause for their stability. The most notable example among these is the Ronosfoss Bridge in Norway.

The center span of this bridge is 600 ft., the sag ratio is 1/10. The distance center to center of cables and stiffening girders is 19.68 ft. The stiffening girders are $15\frac{3}{4}$ in. 101.4 lb. wide-flanged beams having a moment of inertia of 9.65 in.^{2} ft.^{2}. The floor consists of a reinforced concrete slab on steel crossbeams. The total dead load is 1518 lb. per lin. ft. of bridge. The cable stiffness of this bridge is practically the same as that of the Tacoma Narrows Bridge that failed, and its stiffening girders have 50 times smaller moment of inertia than required by the criterion set up for satisfactory wind behavior by the basic structure in the writer's investigations. The bridge was designed for two 10-ton trucks or 40.9 lb. per sq. ft. of roadway live load. The quarter point deflection due to the trucks is 1.15 ft. or 1/523 of the span, and due to uniform load from tower to mid-span the deflection is 2.95 ft. or 1/203 of the span.

It is seen from the foregoing that this bridge holds the record for the ratio of depth of stiffening girders to span length, which is 1/458; for the ratio of depth of stiffening girders to width of bridge, 1/15; and also for static flexibility as expressed by the 1/203 deflection ratio. None the less, no movement of this bridge due to wind was reported, and it carries traffic satisfactorily. The behavior of this bridge would seem to verify the laboratory findings on the Tacoma Narrows Bridge model.

The most important of the bridges whose behavior also indicates the practical validity of the laboratory results is the George Washington Bridge. The cross sectional shape of its deck suspended structure is by no means such a smooth rectangle as that of the Ronosfoss Bridge. Considering the fascia beams, steel curbs and stringers, the depth of its floor structure is 10 ft.; the depth to width ratio is 1/11 and the depth of floor to span ratio is 1/350. The moment of inertia of the stringers and fascia beams is 2800 in.^{2} ft.^{2} and, taking into consideration the whole cross section, a value of approximately 8000 in.^{2} ft.^{2} is obtained about the common axis. Because of the expansion joints in the floor it is difficult to state a moment of inertia value that characterizes the existing structural damping furnished by the floor, and it is still more difficult to evaluate the damping that is supplied by external frictional resistances. But even if 8000 in.^{2} ft.^{2} effective moment of inertia is assumed, this changes the static deflections of the unstiffened cables only by one half of one per cent, indicating that the structural damping due to floor rigidity is negligibly small.

This leaves the damping due to cable stiffness and due to the airflow characteristics of the suspended structure to be considered in order to ascertain the essential factor in the wind stability of this structure. The cables of a suspension bridge have no inherent structural characteristics, their shape as well as stiffness being determined only by the loads they carry. For this reason, the structural damping of the cables, no matter what size they are, is practically zero. The practical range of cable stiffness variation is well represented by the Ronosfoss and George Washington bridges, the latter having cables four times as stiff as the former, yet the latter has oscillated due to wind, so that the movements could be clearly seen and felt, while the former always remained stable. Cable stiffness, therefore, cannot be regarded as an efficient means to control aerodynamic oscillations; the oscillating Bronx-Whitestone Bridge whose cables are 60 per cent as stiff as those of the George Washington Bridge and 120 per cent stiffer than those of the Ronosfoss Bridge also indicates this.

Because all built bridges having practically unstiffened cables seem to behave in wind according to the airflow characteristics of their suspended structures, and not according to the stiffness of their cables, therefore, their aerodynamic damping is the essential factor accounting for their stability.

In conclusion, it appears that the solution of wind stability of a suspension bridge can be approached from two directions: either by furnishing adequate structural damping in the form of stiffening girders of sufficient moment of inertia or by assuring adequate aerodynamic damping by the form of the suspended structure. The former is a well-tried and, within the range of built bridges, an economically satisfactory solution. But the laboratory results, supported by the examples given for the latter, also indicate the possibility of developing structures whose wind stability is assured primarily by aerodynamic damping. As a corollary the economic and architectural advantages in certain cases may be considerable.

Louis Balog,
Consulting Engineer,
New York, N. Y.

Tests on 17-yr. Concrete

Sir: The Fort Snelling-Mendota Bridge (*ENR*, Mar. 31, 1927, p. 514) was opened to traffic Nov. 6, 1926. Immediately before the bridge was opened four lines of levels were run the full length of the bridge floor, and readings taken at intervals of 15 ft. These levels were repeated Aug. 29, 1932 (*ENR*, Sept. 29, 1932, p. 371) and again Nov. 17, 1932 (*ENR*, Mar. 30, 1933, p. 415).

Early in November, 1943, the Minnesota State Highway Department cut a hole through the flat slab floor of the bridge in connection with the installation of navigation lights. This hole was cut in the north gutter of the bridge, which is exposed to the direct rays of the sun in summer and extreme low winter temperatures. The maximum seasonal temperature range to which the surface of this concrete has been subjected is in the nature of 170 deg. F. In addition, this concrete in the gutter of the roadway has also been exposed to the maximum effect of alternate freezing and thawing.

In cutting this hole the Department took cylinders of the concrete in the slab and had them tested. T. W. Thomas reported the tests to E. J. Miller, bridge engineer of the highway department, who kindly furnished me with a copy of the report. I quote from the report as follows:

The cores as received were rather long having a greater ratio of length to diameter than the standard ratio of 2 to 1. They were cut on our carborundum wheel to have a standard ratio. The cut was taken from the bottom of the core since this tended to place the reinforcement close to the end (2 inches away) thus producing the least effect on the strength. The modulus of elasticity was also measured, using the secant method, between unit stresses of about 400 and 1100 pounds per square inch. The tests were made in a saturated condition, the specimens having had ten days soaking before measuring the elasticity and fourteen days before measuring strength. The results follow:

	Ultimate Strength psi.	Modulus of Elasticity psi.
	6636	5,600,000
	6430	5,030,000
	6362	4,450,000
	6975	5,070,000
Ave.	6601	5,037,000

The writer's records of the job show that this concrete was poured July 12, 1926, using 39 gal. of water per cu.yd. of concrete and that the consistency of the concrete was "good." The gravel and sand tests of that date show as follows:

Gravel	
Passing 1 in. mesh screen	100%
Passing ½ in. mesh screen	58
Sand	
Passing ¼-in. mesh screen	100%
Passing #16 mesh screen	55
Passing #30 mesh screen	17

Tests of the cement received on the job at that time, which are undoubtedly representative of the cement used in the bridge floor slab from which the Highway Department took the cores, averaged as follows:

Initial set	2 hr. 29 min.			
Final set	5 hr. 54 min.			
Residue on 200 sieve	19.5			
Steam pat	O.K.			
	7 day		*28 day*	
	A	B	A	B
Tensile strength psi.	347	342	459	435

Concrete cylinders taken from the concrete being placed in the bridge floor slab at about the same time that this slab concrete was placed showed as follows:

	Maximum	Minimum	Average
Compression, psi. 28 days	3120	2763	about 2940

Thus it will be seen that the four cores recently tested at the age of 17 years, 4 months, averaged a little more than twice the 28-day compressive strength of the concrete used in the floor slab.

This recent test is also a rather clear indication that the control tests set up for the selection of the aggregates and cement and the specifications covering cement, aggregates, water, mixing, placing and curing of the concrete have been amply justified by the results. It may also be interesting to note that the flat slab spans in this bridge floor, one bay wide with over-hanging cantilevers, are 36 ft. by 30 ft. 5 in. The slab forms, under the particular span from which the cores were taken, were removed 10 days after the concrete was poured.

Walter H. Wheeler
Designing & Consulting Engineer
Minneapolis, Minnesota

Stresses in Wall Brackets

Sir: I have found two errors in my article "Stresses in Anchors for Wall Brackets" published in *ENR* Nov. 18, p. 760. Near the bottom of the middle column on page 761 in the equation formed by equating formulas (1) and (2), the denominator on the left hand side should read $7y-3.96$, and that on the right should contain a times sign after the 30 instead of a plus sign.

William I. Powell
Mechanical Engineer,
Board of Water Supply
New York, N. Y.

Effect of Functionalism

"Well, to sum it all up, it is my contention, supported by considerable first-hand experience, that it is a tough job to raise the standard of art much above the level of contemporary public taste, especially in an age in which public taste is changing so violently. Sculpture has become an incident in architecture, and architecture in engineering. As we go more and more functional, ornamentation becomes a lost art, and only the isolated monument, exposed to time, the elements and the vandals, remains.

"Steel and other structural metals have dwarfed outdoor sculpture except in gardens, and mass effects and intrinsic beauty of line now occupy the engineer as much as stresses and strains. The architects and sculptors will have to adapt themselves to this age or be driven indoors with the painter; and all the restrictions which have for their purpose rigid professional lines and guild vacuums merely postpone the day of reckoning."—Robert Moses, *Commissioner of Parks, New York, in a discussion of statues in New York's parks in the* New York Times, *Nov. 21, 1943.*

EDITORIALS

VOLUME 131 NUMBER 25

December 16, 1943

Peace on Earth . . .

AT a time when peace and goodwill seem to have fled from the earth, the festival of Christmas is doubly welcome, offering as it does opportunity for us to reaffirm our determination to attain these highest and most difficult of human aspirations. And even though grim and grief-laden days may lie ahead, the outlines of victory and a bright postwar world can be discerned just beyond. If not a festival of gaiety, Christmas of 1943 may still assuredly be one of hope and thanksgiving.

CIVIL engineers and construction men, particularly, can approach Christmas this year in such a spirit. Both at home and abroad, and either as civilians or members of the armed services, they can take pride in war construction achievements that are hastening the return of peace. Moreover, some have already turned to planning for the time when that peace shall be an actuality. These are the satisfying tasks, the ones that have made the profession great in the past and will make it even greater in the future.

AND so to our friends and compatriots, wherever they may be, we send our sincere greetings. May your Christmas be hopeful and bright, and may the New Year remove the mockery that war has made of "Peace on Earth, Goodwill Toward Men."

The Staff of Engineering News-Record

Sheep from the Goats

SOMETHING NEW has been added in the way of classification of engineers in the proposed licens law for engineers in the District of Columbia tha is now before Congress. The bill requires the boar of licensure to issue a "professional engineer's cer tificate of license" to each engineer who will "certif under oath that he will receive no profit from th subject matter of his professional employmen other than his salary or charges for professiona services rendered; and that he will not have an substantial financial interest in, nor render othe than purely technical services to any concern pro viding or handling materials or products covere by his design". These appear to be the sheep. Th goats are thus defined: "Upon request of any perso refusing to take the above oath, the board shall issu a license . . . but omitting the term professional." The reason for this peculiar distinction is not clear but whatever the purpose behind it, the effect o having such a questionable provision in an enginee license law passed by Congress can only be harmful The bill should be defeated.

Overloaded Highways

A MOST SERIOUS aspect of the war emergency is th rate at which relatively new highway pavement are being destroyed by trucks overloaded on th excuse that the overloading is essential to the wa effort. Many states reported serious injury to thei roads from this cause at the recent meeting of th American Association of State Highway Officials Moreover, the evidence clearly indicates that mos of the overloading is unnecessary. Organization of truck operators are so powerful in many states that their word carries more weight with the legislators than that of the states' own highway officials The situation is one calling for action by a nationa war agency such as the Office of Defense Transportation, yet it appears probable that the ODT will not act unless the state highway departments bring some concerted pressure to bear on it. United action is called for.

Big Culverts

INTERESTING EVIDENCE of the war's effect on engineering design is found in the big arch culvert of 25-ft. span pictured on p. 884 of this issue. In normal times a stream of the size carried by that culvert would have been crossed by a simple bridge of steel spans supported on concrete piers. But in these abnormal times steel for the girders was eeded for ships and shells. Substitution of culverts f such large size for bridges is unusual but not ithout precedent. Some thirty years ago when the ational Transcontinental Ry. was being pushed rough the wilds of northern Ontario the con-ractors needed the grade line to move supplies head through the almost trackless forest. Stream rossings were bottlenecks as bridge plans had to e approved by the head office back in civilization, hich meant weeks of lost time. Culvert plans, on e other hand, could be approved by engineers in e field. This gave one of the contractors an idea. He suggested substitution of concrete culverts of 0 and 25 ft. opening. The proposal was accepted, esigners were put to work in the field, and the ottlenecks soon were broken. Big culverts do have place in the bridge field under some conditions.

hreat of Surplus New Equipment

T IS GENERALLY agreed that maintenance of pro-uction is the only way to provide gainful employ-ent for both present civilians and returning armed orces after hostilities cease. Yet clouds already re forming that threaten to hamper future pro-uction. One of these clouds represents the sur-lus new equipment that may be on hand at the nd of the war. Used equipment in good condi-ion is another and perhaps more sinister cloud, ut the new equipment situation is worth discus-ion by itself.

The problem of new equipment is highlighted y the fact that the government already has begun ffering certain surplus new capital goods for sale, hich is stimulating the organization of get-rich-uick groups to grab bargains and dump them on he market. Such indiscriminate dumping would ripple production, with resulting curtailment of mployment, thus defeating the aim of continued perations; therefore the present trend is disturb-ng to the construction equipment industry.

There is still time for intelligent planning on the art of the industry, and equally intelligent cooperation by the government to correct this potentially dangerous situation. For that reason, a lan suggested by Fred Salditt, vice president of he Harnischfeger Corp., deserves careful con-ideration.

Referring only to shovels, cranes and draglines, Mr. Salditt points out that 10,000 units will be produced in 1944 as compared with 3,000 in 1939. Looking ahead, he sees 6,000 units per year, or 12,000 total, required the first two years after the war. Estimating 3,000 government-owned new units always in the distribution funnel, i.e. between the shops and the points of use, he sees this number on hand regardless of when peace comes. If these 3,000 machines were to be dumped on the market at one time, production would virtually cease for the ensuing six months; and once production and employment come to a halt, it takes a long time to get them restored. However, if the government's 3,000 units were to be released on a controlled schedule over a period of two years, production of additional machines could proceed at the rate of 4,500 per year. Thus, output and employment would be 50 percent greater than for the normal year 1939.

Disposition of surplus equipment solely by governmnet agencies would invite purchase by parties intent only on dumping the products at a quick profit, postponement of demobilization of government agencies, and needlessly low prices. Mr. Salditt suggests that private industry—the manufacturers—handle distribution of the surplus equipment with, of course, government cooperation. Each manufacturer would be furnished a list of surplus units of his own make, and their location. He would contract to purchase these units from the government at a price of 75 percent of his prevailing shop costs. Then he would resell the units from 25 to 30 percent below the price of similar machines being made at the time, and at the rate of one surplus unit to every three newly made machines. The government would be paid when the manufacturer receives payment from the ultimate purchaser.

Such a plan, said already to be under consideration by WPB, might have merit for the entire construction equipment industry. The manufacturers could utilize their selling, distribution and credit setups. They could improve the surplus equipment with attachments and features demanded by the trade. And finally they would have a practical interest in disposing of the government equipment in an orderly manner and at reasonable prices that would bring a fair return to the taxpayer.

Some such plan is needed, and it is not too early to formulate it. Otherwise we face the prospect of a chaotic market, loss of needed employment, and a huge waste to the taxpayers who paid for the surplus machines in the first place.

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Relocation of the Southern Railway Above the Fontana Reservoir

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***Contents in Brief**—Relocation of 24 miles of the Southern Railway was made necessary by construction of Fontana Reservoir. By taking the rail line out of the river valleys its length was shortened over eight miles. Scarcity of steel for bridges made it desirable to avoid valley crossings and to use high fill where a viaduct normally would have been employed. Fills across arms of the reservoir were built to be stable under sudden drawdowns.*

TWENTY-FOUR MILES of the Murphy Line of the Southern Ry. in North Carolina that will be flooded by Fontana Reservoir on the Little Tennessee River is being replaced by a 15.35-mile relocation involving over 3,000,000 cu.yd. of grading now being rushed to completion by the Tennessee Valley Authority.

The rugged, mountainous terrain which the relocated railroad traverses would necessitate unusually heavy grading operations at any time, but war conditions have substantially magnified the difficulties of design and construction. In order to save critical material the new line is being carried across many side valleys on embankments of unusual height, where in normal times bridges would be built. Several of these fills exceed 100 ft. in height; some extend more than 100 ft. into the fluctuating reservoir, thus calling for special care in their construction. Where bridges could not be eliminated, they had to be designed to make use of steel members that were on hand from previous bridge replacements in other TVA reservoirs or from the old railroad line in the projected reservoir. These limitations on bridge layouts became governing features in locating the river crossings.

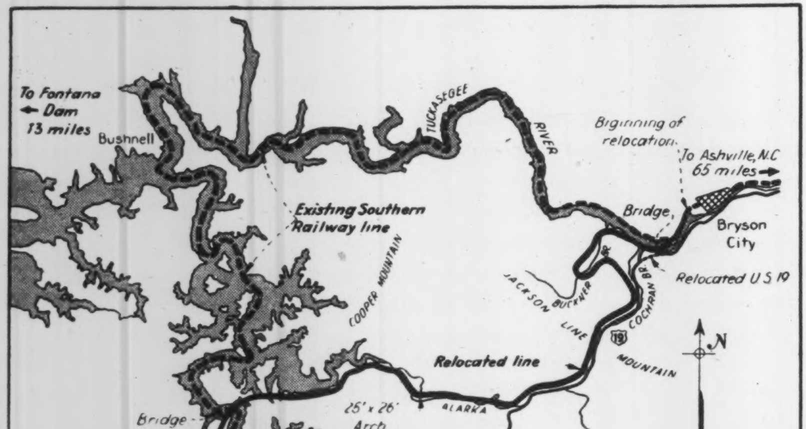

To Fontana
← Dam
13 miles
Bushnell
TUCKASEGEE
RIVER
Biginning of
relocation
To Ashville, N.C
65 miles →
Existing Southern
Railway line
COOPER MOUNTAIN
Bridge
Bryson
City
JACKSON
BUCKNER
LINE
MOUNTAIN
COCHRAN BR.
Relocated U S 19
19
N
Relocated line
Bridge
25' x 26'
Arch
ALARKA
LITTLE
Almond
19
TENNESSEE
RIVER
NANTAHALA
RIVER
CREEK
Two bridges
removed
Channel
change
Wesser
19
28
SCALE IN MILES
0
To Murphy, N.C
← 34 miles
End relocation

Fig. 1. The old railway line followed river valleys to avoid heavy grading. The new line climbs out of the Little Tennessee River valley and crosses into the Tuckasegee River valley through a gap in Jackson Line Mountain, saving over eight miles in distance but requiring heavy grading.

The impact of war conditions was felt strongest in the time allowed to carry out this work. Demands for more power for industries producing war material resulted in an acceleration in the schedule for the Fontana project, which provided less than two years for surveys, design, and construction of this railroad relocation.

Relocation studies

The existing railway leaving Bryson City at El. 1730, extends down the Tuckasegee River to its confluence with the Little Tennessee at Bushnell, crossing the former stream at El. 1474. It then follows the gorge of the Little Tennessee and Nantahala rivers upstream reaching El. 1722 at Wesser. The grade is essentially parallel to the river profile and is located along the riverbank a few feet above normal high water. Those portions of the old railroad that are affected by the pool are located in deep narrow river canyons. This kind of topography and the fact that the track at Bushnell is 236 ft. below pool level obviously eliminated the possibility of raising or relocating along the general route of the existing line.

Studies for the relocation were greatly expedited by the availability

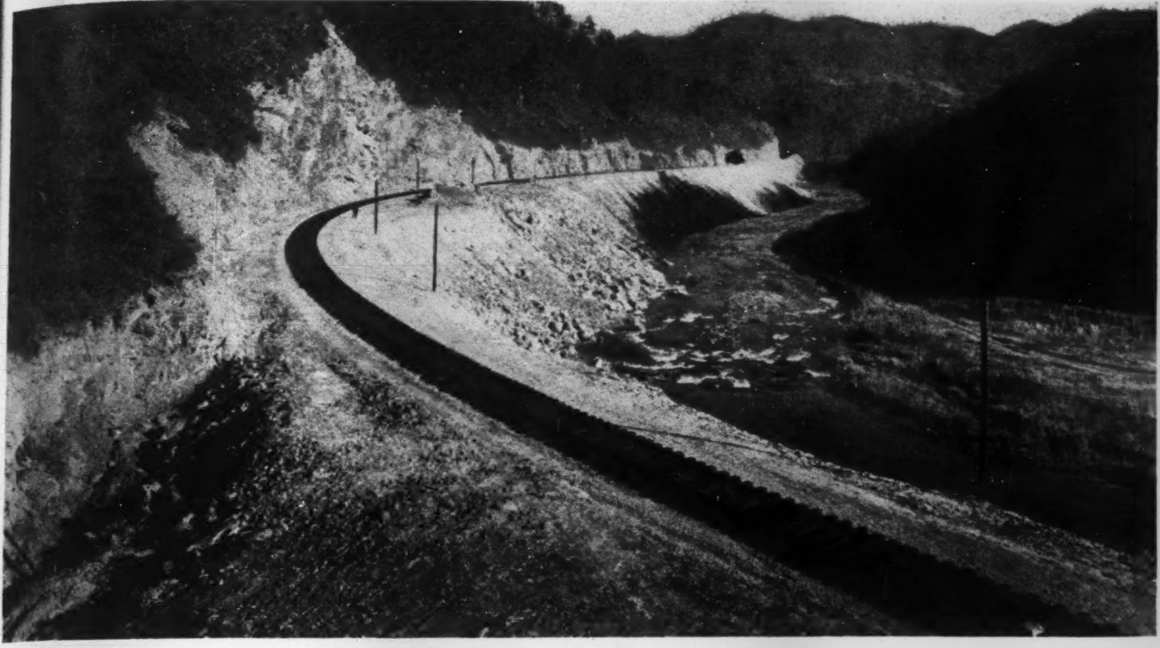


Fig. 2. Heavy grading in rock where the new line is carried 70 ft. above the Nantahala River in its upper reaches.

of aerial photographs and complete topographic maps previously made by the Tennessee Valley Authority in cooperation with the United States Geological Survey. These maps, having a contour interval of 40 ft. and with a horizontal scale of 1:24,000, enabled the authority to select the most feasible general location with a minimum of field reconnaissance surveys, which were expensive and time consuming due to the mountainous terrain, nearly all of which is timbered and covered with a dense undergrowth of laurel and other mountain vegetation. In sections where alternative locations seemed possible, the contour maps were enlarged to the scale of 1:6,000 so that more detailed study could quickly select routes worthy of field survey.

Final location made

After the general route had been selected, detail topography with 10-ft. contours was taken in the field and plotted to a scale of 1 in. equals 100 ft. The final location was projected by careful study of these maps and then staked in the field. General studies were started in March, 1942, and the surveys, design, and right-of-way acquisition had progressed sufficiently to permit construction on about one-third of the line to start by Oct. 15, 1942.

The relocation finally adopted is 15.35 miles long, or 8.4 miles shorter than the line being replaced. This reduction in length was accomplished by moving about two-thirds of the relocation out of the main river valleys, which will be inundated, and by obtaining a more direct location between Bryson City and the mouth of the Nantahala River. A low gap in Jackson Line Mountain, which can be reached by ascending the narrow valleys of Cochran Branch and Alarka Creek, makes this more direct route possible. Between the mouth of the Nantahala River and the west end of the relocation at Wesser, the most feasible solution was to construct the railroad above the pool level along the side of the almost precipitous Nantahala Gorge.

Little steel for bridges

The wartime necessity of using no new steel in the bridges made determination of the final location considerably more difficult. The old Southern Ry. bridge across the French Broad River in the Douglas Reservoir, part of the construction bridge for Douglas Dam, and a few spans on the existing railroad being replaced by this project constituted all the steel available for superstructures on this relocation. Consequently, careful studies and detail surveys of several crossings were necessary in order to select bridge sites to which the available bridges could be fitted, and also to obtain reasonable alignment, grades, and costs for the adjacent roadway. In order to obtain a crossing of the Tuckasegee that was suitable for the bridge steel on hand, it was necessary to relocate 0.5 mile of U. S. Highway No. 19.

The railroad as relocated requires only three major stream crossings; namely, Tuckasegee River, Little Tennessee River, and Alarka Creek. Bridges are required for the two rivers, but Alarka Creek was crossed on a fill 75 ft. high, the creek being carried through a 25-ft. reinforced concrete arch 172 ft. long. Two other crossings of the creek were avoided by minor channel changes in the creek. A major change of the Nantahala River at Wesser near the end of the relocation eliminated two bridges and made 600 ft. of deck girders in the existing structures available for use elsewhere in the TVA construction program. This latter channel entailed 60,000 cu.yd. of excavation, most of which was solid rock.

Grades on the new line

The relocation and design are predicated on equal replacement of existing facilities. Using this principle, the ruling eastbound gradient, which is in the direction of the heaviest traffic, was established as 0.90 percent. In order to reach the summit at Jackson Line Gap, it was necessary to use the 0.90 percent grade most of

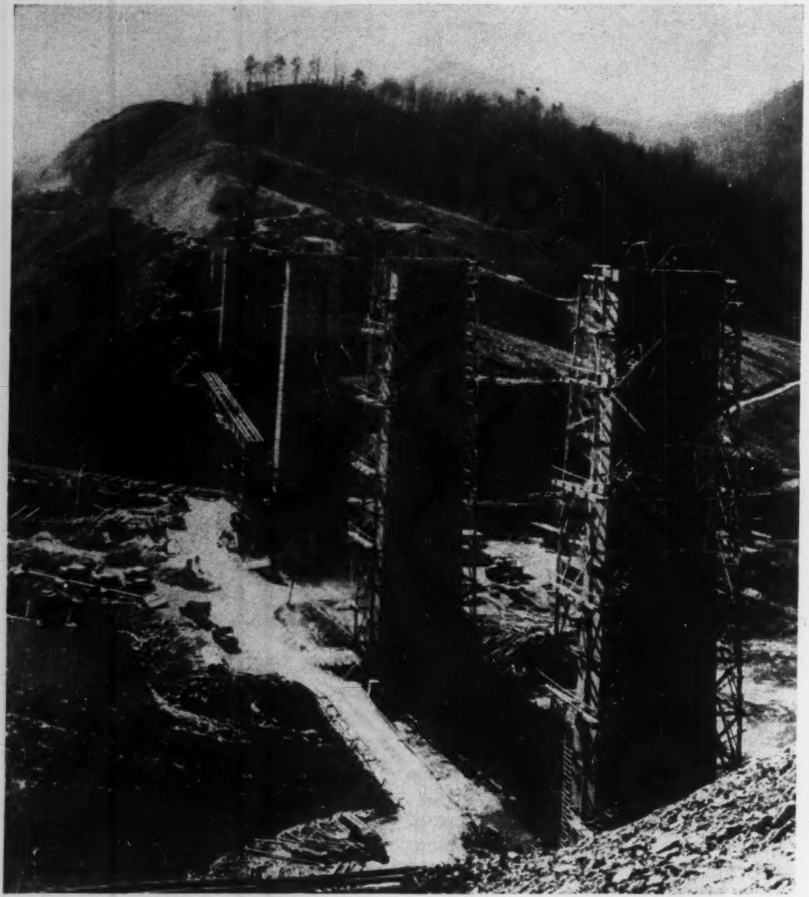


Fig. 3. Bridges were so located as to make possible the best use of available steel spans, no new steel being obtainable. This is the crossing of the Little Tennessee River and the old railway line that will be flooded.

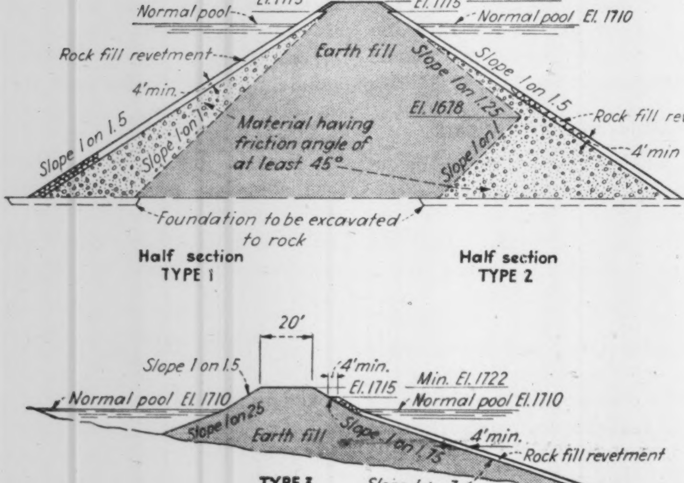

20'
El. 1715
Normal pool
El. 1715
Min. El. 1722
Normal pool El. 1710
Rock fill revetment
Earth fill
Slope 1 on 1.25
Slope 1 on 1.5
4'min.
El. 1678
Rock fill revetment
Slope 1 on 1.5
Slope 1 on 1
Material having friction angle of at least 45°
Slope 1 on 1
4'min
Foundation to be excavated to rock
Half section TYPE 1
Half section TYPE 2
20'
Slope 1 on 1.5
4'min.
El. 1715
Min. El. 1722
Normal pool El. 1710
Normal pool El. 1710
Slope 1 on 2.5
Earth fill
Slope 1 on 1.75
4'min.
Rock fill revetment
TYPE 3
Slope 1 on 3

Fig. 4. Fills that will be submerged in the reservoir area have been built to insure their stability when the reservoir is drawn down. Three types of construction were used, depending on the available material.

the way between the Little Tennessee River and the gap, or for a distance of about 5.0 miles. The maximum grade descending from the gap to Bryson City is 1.30 percent. About 3.1 miles of this grade is necessary, but it is separated into two parts by about 0.7 mile of 0.43-percent grade. The ruling grades in each direction are compensated for curvature. A setout track, equal to one-half the length of the longest train normally anticipated, is provided just west of the crest of 1.30-percent grade.

The grade from the Little Tennessee River to the west end of the relocation, a distance of 5 miles, is generally level except for slight variations through some of the longer cuts to provide better drainage.

Few sharp curves

The total central angle for the 15.35 miles of new construction is 2,341 deg., or 153 deg. per mile, which is not excessive when compared to the existing line or to railroads located in similar mountainous topography. There is only one 14-deg. curve. This curve is located where an abrupt bend of 125 deg. in the Nantahala River and the precipitious rock wall of the canyon does not permit the use of a flatter curve without unreasonable expense. There are two 12-deg. curves and six 10-deg. curves, which are made necessary by very rough topography and which could not be avoided without unjustified expenditures. All other curves are 8 deg. or less.

The roadbed is designed for a minimum width of 20 ft., exclusive of ditches. The fills are overbuilt 2 to 5 percent to allow for subsidence and shrinkage. The minimum ditch in cuts is 3 ft., but wider ditches are used on long level grades and through the deeper cuts to provide adequate drainage. The maximum cut is 153 ft., and the highest fill is 130 ft. from toe of slope to subgrade. Cut slopes vary from 1 on 0.25 in solid rock to 1 on 1.5 in earth. Fill slopes which are not below the pool level are 1 on 1.5.

Special embankment designs

The exceptionally high embankments extending into or crossing arms of the reservoir presented one of the major problems of design. Some of these fills will be submerged to depths of more than 100 ft. at normal pool, and, while much of the

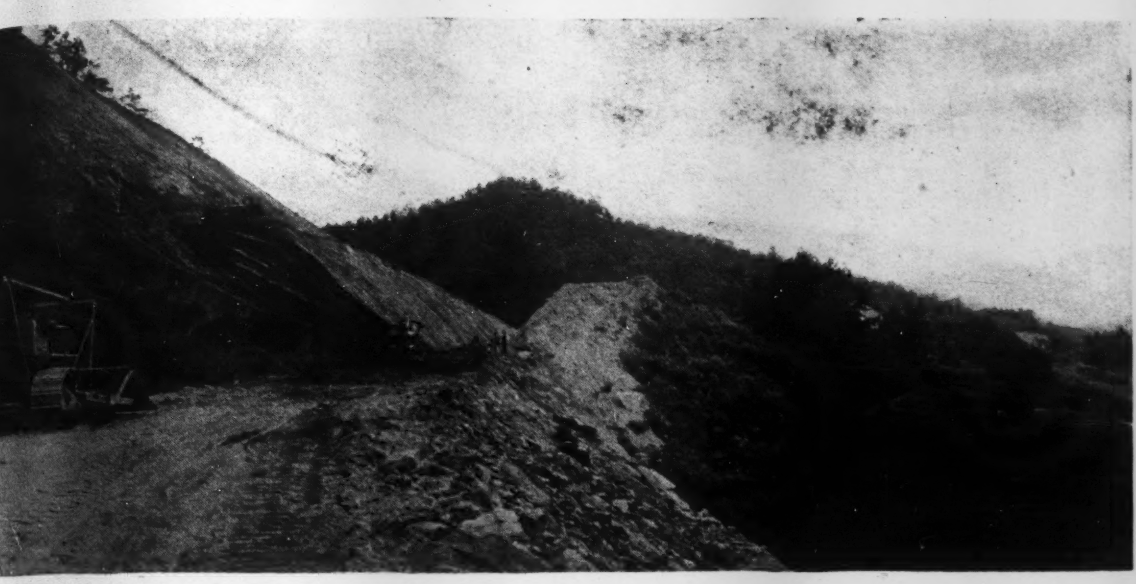


Fig. 5. Making a cut for the rail line in the Alarka Creek valley that is 135 ft. above the grade line on its high side.

xcavation is solid rock, several of e largest and highest embankments rough the reservoir occur in areas here the adjacent excavation is not ck. Since the Fontana project is degned for a reservoir operation with normal drawdown of 135 ft. and an treme drawdown of 185 ft., it was cessary to design these embankents for the sudden drawdown contion of saturation without subergences.

Laboratory analyses of a large mber of soil samples indicated with markable uniformity that the soil d low values of cohesion and coficient of friction, and that none of is material would be stable in the eper fills with the relatively steep opes desired. In many instances the rrow river gorge or the steep cross ope precluded any consideration of opes flatter than 1 on 1.5. At other aces where flatter slopes were posble, expensive drainage structures ade their use very undesirable. Consequently, three principal design pes were developed for the embankents subject to submergency by the servoir (Fig. 4). Types 1 and 2 e used where 1 on 1.5 slopes are andatory or where this design is ore economical than flatter slopes ith less rock on account of drainage ructures. The choice between types and 2 is based on the relative cost each case, which depends on the vailability of rock, the stability of e earth slope prior to placing the ck blanket, and the most feasible quence of construction operations as applied to the dirt- and rock-moving equipment. The Type 3 section was used at locations where the cross slope was not too steep and where rock was not available in nearby roadway cuts, provided drainage and other conditions permitted its use. The slopes were varied depending on the height of fill and the quality of the soil to be used in each case, the section shown being most typical.

Heavy slope protection

In Types 1 and 2 the material specified as having a friction angle of 45 deg. or more was described as loose rock, hard shale, or gravelly material of any gradation containing not more than 25 percent earth. The specifications for the rock on the outside of each of the three sections which is indicated as "Rock Fill Revetment" require that the rock be hard, sound, and durable, that 70 percent in the outer two feet be one cubic foot or larger, and that sufficient small stone or fines be present to choke the voids in the larger rock adjacent to the earth slopes. Experience in similar work in other reservoirs has proved that this type of revetment adequately protects the earth embankments against erosion and wave action and is more economical in most cases than hand-placed riprap, where rock is available in sufficient quantity within reasonable hauling distance. It also has the advantage of being adaptable to steeper slopes than the usual 10- or 12-in. hand-placed riprap and does not require the large amount of hand labor, which is practically unobtainable at the present time.

The specifications for placing embankments require that earth fills affected by the reservoir be placed in layers not exceeding 6 in., that they be compacted to obtain the desired density by operation of the hauling equipment, and that sheepsfoot rollers be used where necessary. Fills outside the reservoir may be placed in 12-in. layers. End dumping and side casting to form embankments are not permitted.

The right-of-way is a minimum of 100 ft. each side the center line except at a few places where the most feasible location approached the existing highway too closely to permit that width. The right-of-way is heavily wooded, hence clearing was held to a minimum, which was set at 50 ft. each side the center line or 20 ft. beyond the grading limits, whichever is greater.

The uneven topography, broken by numerous ravines, makes an unusually large number of drainage structures necessary. Approximately 9,100 ft. of extra-strength (3,000 D) and double-strength (4,000 D) reinforced concrete pipe in sizes varying from 24 to 72 in. was required. Double lines of large pipe were used in many instances instead of concrete box culverts in order to conserve reinforcing steel and to expedite design and construction by eliminating special box-culvert designs. One 16x16-ft. and three 10x10-ft. reinforced concrete

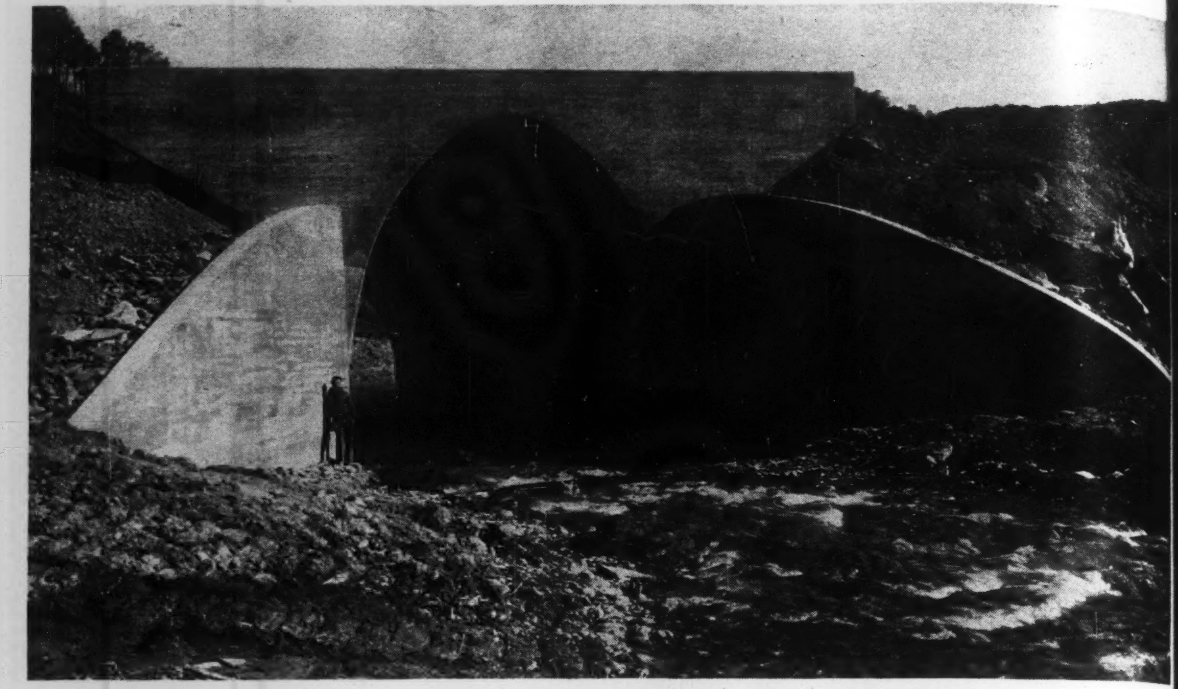


Fig. 6. Unusually large arch culverts were used for stream crossings where steel spans would have been specified under normal conditions. This is the Alarka Creek culvert a 25-ft. arch, 172 ft. long.

arch culverts were constructed under high fills where relatively large openings are required. The flow line of one of the 10x10-ft. arches is 120 ft. below subgrade. Seven reinforced concrete box culverts varying in size from 5x8 ft. to 8x12 ft. were designed for intermediate drainage areas where the fills are relatively low, or where foundation conditions are not satisfactory for arch designs.

As previously stated, three major structures are required, including the 26x25-ft. concrete arch 172 ft. long at Alarka Creek which extends through a 75-ft. fill. The Tuckasegee bridge consists of a 169-ft. through-truss center span with two 63.3-ft. deck-plate-girder spans on each side, making a total length of 426 ft. The substructure will be concrete abutments on H-piles and piers having a maximum height of about 45 ft. The bridge for the Little Tennessee River will be 776 ft. 6 in. long between backwalls and will consist of four 157-ft. through-truss spans and two 67-ft. deck girder spans. The maximum pier height is about 160 ft. One unusual feature of these bridges is the fact that the superstructure will be composed of spans obtained from several different sources. One 169-ft. truss is to be taken from the portion of the railroad to be abandoned, making it necessary to construct a temporary crossing to carry traffic until the new line is placed in service. A 76-ft. creosoted-timber trestle is also required at one point to provide an underpass for an important local road.

Other major items of construction

The major items involved in the construction of this project in addition to bridge erection and track work are approximately as follows:

Unclassified excavation	2,750,000 cu.yd.
Earth borrow excavation	350,000 cu.yd.
Rock borrow excavation	100,000 cu.yd.
Concrete (arch and box culverts)	7,000 cu.yd.
Concrete (bridge piers)	5,600 cu.yd.
Pipe culverts	9,100 lin.ft.

One difficult construction problem was imposed by the fact that about one mile of the new line is located on the side of the Nantahala Gorge above the existing track over which traffic had to be maintained. By careful coordination of construction operations this portion of the work was completed without delay to rail traffic.

The Utah Construction Co., Ogden, Utah, has a contract for grading and drainage of a 7-mile section of the project, which involves about one-third of the total excavation. The remainder of the work including all of the bridges is being done by TVA forces.

Although actual construction started Oct. 15, 1942, very little progress was made prior to March 1, 1943, due to unfavorable weather. The construction is scheduled for completion Dec. 31, 1943, and work is now proceeding on schedule.

C. E. Blee is chief engineer of the Tennessee Valley Authority. George R. Rich is chief design engineer, and A. L. Pauls is chief construction engineer. The location and design were carried out under the direction of A. A. Meyer, head civil design engineer, and K. C. Roberts, head structural engineer, with the writer and Everett Scroggie, senior structural engineer, in direct charge of this work. F. E. Junior, principal civil engineer, is the project engineer for highway and railroad work. Negotiations with the Southern Railway Co. are handled by J. B. Sullivan, who, as head railroad engineer, is also responsible for the broader phases of location, design and construction. Field engineering is under the general supervision of E. M. Arnold, principal civil engineer, with R. H. Gleaves as resident engineer. T. D. Lebby is in charge of the TVA construction and maintenance division, which is performing the work for the Authority, with L. M. Ragsdale the superintendent on the job. C. H. Pozer is resident engineer for the Southern Railway Co.

Prestressed Concrete Pipe By a New Manufacturing Method

Contents in Brief—*An advance in the art of making reinforced concrete pressure pipe is represented in the utilization of the principle of prestressing steel in tension and concrete in compression. The methods used by the Lock Joint Pipe Co., which recently completed its first commercial manufacture of 75,000 lin.ft. of 30-in. pipe, resulted in a saving of 1,000 tons of steel compared with that normally used for pipe of the same pressure design.*

REINFORCED CONCRETE PIPE with the steel stressed in tension and the concrete stressed in compression has recently been made for water system extensions in Washington, D. C. and vicinity. The application of the prestressing principle in the manufacture of this high head concrete pressure pipe resulted in important savings in tonnage of steel required, a fact which was applauded and approved by the Washington authorities interested in the conservation of critical materials.

Pipe was supplied for three installations—two in the District of Columbia and one for the Washington Suburban Sanitary Commission—the total order amounting to about 75,000 lin.ft. of 30-in. pipe. The saving of steel in these three jobs amounted to more than 1,000 tons when compared with the tonnage required for steel cylinder reinforced concrete pipe for the same head, and nearly 2,000 tons when compared with the tonnage required for steel pipe of $\frac{5}{16}$-in. plate.

The manufacturing was carried on at a plant on the outskirts of Washington and the pipe trucked directly to its position on the three contracts. The pipe was made by the Lock Joint Pipe Co. using methods developed by them, and this is one of the first major installations of its type.

The new prestressed concrete pipe follows the general Lock Joint design in having a continuous welded steel cylinder with steel joint rings forming bell and spigot ends, and with a rubber gasket as a sealing element. This cylinder is centrifugally lined with concrete to a thickness of $1\frac{7}{8}$ in.

After proper curing of the concrete, this lined cylinder is spirally wound with No. 6 high tensile strength wire under tension, imparting an initial

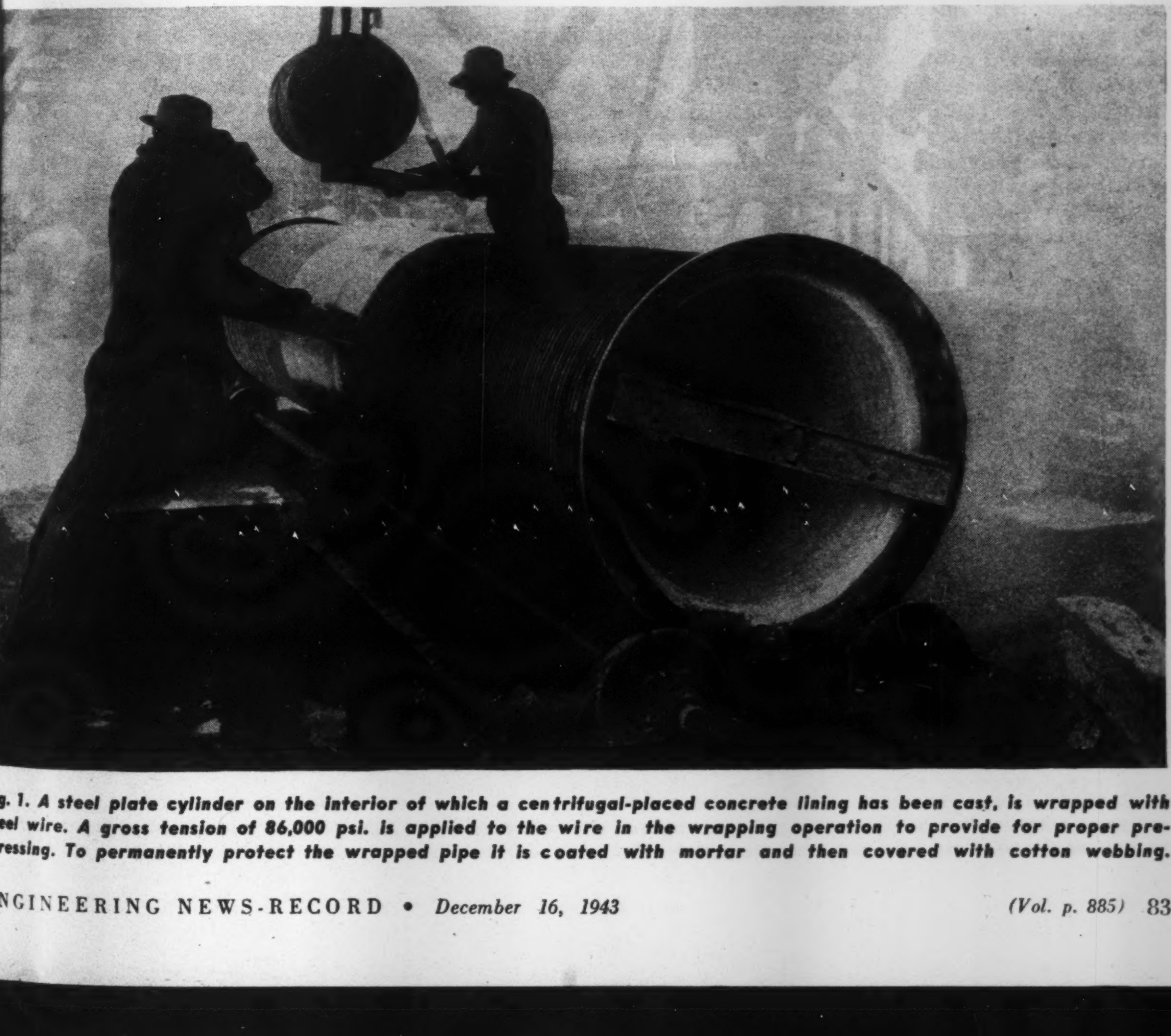


Fig. 1. A steel plate cylinder on the interior of which a centrifugal-placed concrete lining has been cast, is wrapped with steel wire. A gross tension of 86,000 psi. is applied to the wire in the wrapping operation to provide for proper prestressing. To permanently protect the wrapped pipe it is coated with mortar and then covered with cotton webbing.

compression in the cylinder and concrete core. The steel structure of the pipe is protected by a ¾-in. thick coating of cement and sand mortar, which is applied by ejecting the mortar between rapidly revolving brushes against the rotating pipe. After steam curing, the pipe is stored in the yard preparatory to delivery.

Steel for the cylinders comes to the job in full pipe length, cut to proper width so that three sheets make the required circumference. These No. 16-gauge sheets are shipped flat and put through rolls on the job to bring them to the proper radius, then are held on specially prepared jigs while they are tack-welded together.

Prefabricated joint rings for the ends are then attached. The pipe fabrication jig holds the end rings to the exact length of the pipe and exactly square while the entire unit is tacked together. Circumferential welds at the joint rings and the three longitudinal welds are made while the seams are held tightly together in a press.

The jigs are so arranged that welding can be done down-hand, all welding being done manually using $\frac{5}{32}$-in. coated rods. Following the welding operations the steel cylinder is given an hydraulic pressure test at a pressure corresponding to a unit stress in the steel of 25,000 psi. Every welded seam is inspected under this pressure to make sure it is watertight.

The completed cylinder is then set on end with special castings placed over the joint rings and around the center of the cylinder to assure perfect roundness during the centrifugating operation. A heavy steel cylindrical frame is lowered over this preparatory to centrifugal placing of the concrete. The frame has heavy wheel castings at each end, and when operating it rests in a horizontal position upon driving rollers that can be turned at variable speed to accommodate the centrifugal process.

Concrete for the interior of the cylinder is mixed in a paver and discharged into a special placing device. The latter utilizes a screw drive to discharge concrete from the end of a long pipe that is run into the open cylinder for distribution throughout the full length. The mix is 8 bags of cement per cubic yard of concrete with 1½-in. slump and ⅝-in. maximum size aggregate for the 1⅞-in. thick lining. The cylinder is rotated at 100 rpm. while filling, centrifugal force spreading the concrete evenly throughout the pipe.

In a period of seven minutes the pipe is brought up to a rim speed of 2,600 fpm., comparable to about 294 rpm., and revolved at that speed for 10 minutes. Excess water in the concrete mix comes to the surface and is blown out the opposite end of the pipe by a jet of compressed air as the pipe is revolving. The jet is on a long arm of a counterbalanced carriage and can be moved slowly through the full length of the pipe.

Centrifugalization removes all excess water and makes the concrete immediately hard enough so that th cylinder can be picked up and stoo on its end. The exterior frame can b immediately released and remove for re-use, so the spinning operatio is kept continuous with only thre cylindrical frames and two spinnin machines.

The centrifugally cast concrete i cured by steam in the vertical position. Use of steam assures a uniform rate of curing regardless of th weather, and the concrete lining quickly attains the requisite strength to sustain the compressive stress o the wire-winding operation.

Before it is wound with wire, however, the lined cylinder is placed in horizontal position and submitted to the action of a honing machine. A power-driven rapidly rotating device spins carborundum type abrasive blocks against the interior of the concrete lining, thus cutting down any irregularities on the inner surface of the lining, including occasional projecting pebbles.

The centrifugally lined cylinder is then moved to the wrapping machine, where the pipe is turned by mechanical means and the wire is wound spirally on the pipe. Wrapping is done with high tensile strength steel wire No. 6 gauge, 0.192 in. in diameter. A gross tension of about 3,000 lb., or 86,000 psi. is applied to the wire in the wrapping operation.

This wire, which has a minimum tensile strength of 185,000 lb. per

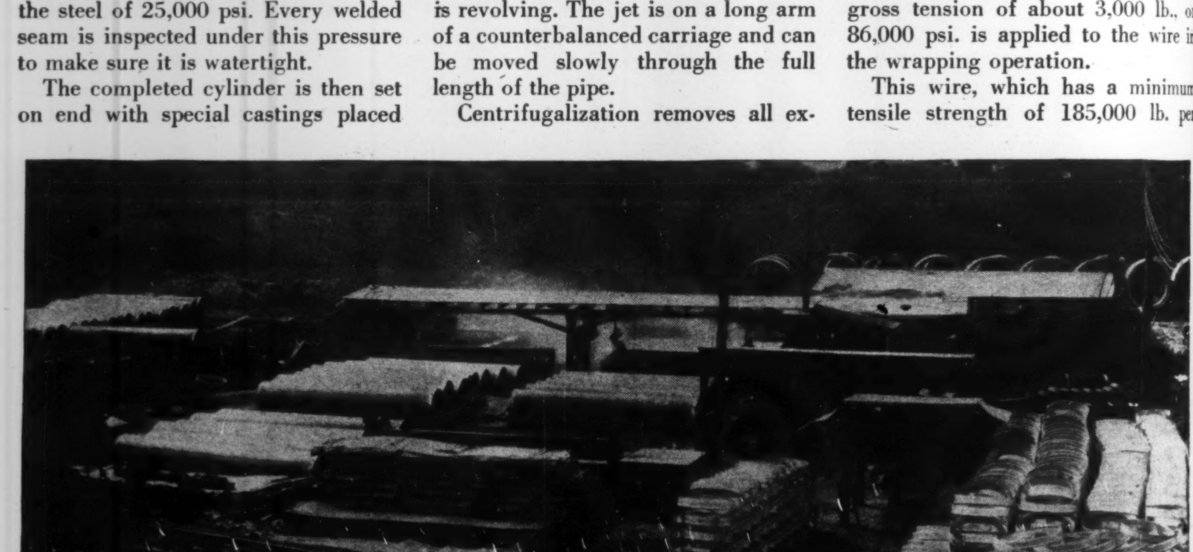
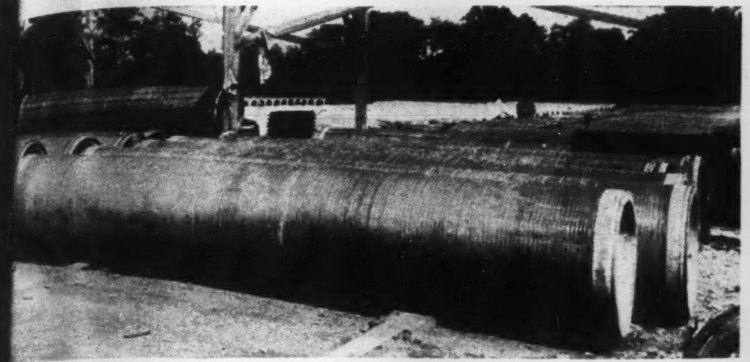


Fig. 2. Steel cylinders for the pipe are made from No. 16 gauge flat sheets. The width and length of the sheets is such that three pieces rolled to the proper radius on the job site will form a complete cylinder. Prefabricated joint rings for the ends of the pipe are attached after the cylinder has been welded together.



. 3. Structurally, the pipe is complete as soon as the wire is wrapped and made ure. However, to protect the exposed steel from soil corrosion, a ¾-in. rtar coating is applied.

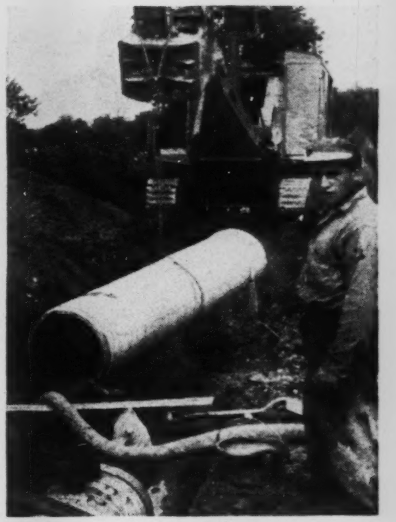


Fig. 4. Five days after its manufacture the pipe has attained satisfactory strength and can be handled into place.

in., is pulled off spools and through traveling variable speed machine t can vary the distance between ppings of the spiralling wire. The ximum desirable spacing is about n. but it may be used at much nar- er spacing on pipes designed to hstand higher pressures.

Holding tension on rapidly mov- wire is accomplished through an enious counter-weighted hoist ar- gement in which a drum actuated an electric motor tightens on the e as needed. An automatic electric tact makes the adjustment as the nterweighted device drops a little, s closing a switch.

The design of the pipe is such that concrete will always be in com- ssion under operating conditions. Structurally, the pipe is complete soon as the wire is wrapped on and de secure, but a mortar coating is plied to permanently protect the e. For this operation the pipe is ved while the coating is being ap- ed.

Mortar is prepared in a small xer and fed by a screw device set supply a measured amount of ma- ial to coat the pipe ¾ in. thick. A rriage traveling at a fixed speed ves beside the pipe while the mor- is forced between two rapidly ro- ing wire brushes turning together, e clockwise and the other counter- ckwise. The brushes throw the rtar with great force at the revolv- pipe forming a smooth covering uniform thickness, which affords perfect outside protective surface the pipe.

The freshly coated pipe is then apped with a loosely woven cotton bbing to minimize any possible ndency for the mortar to be dis- aced prior to its taking initial set. The webbing is applied in the same operation as the mortar.

After the coating operation the pipe is moved, still horizontal, to a position where it can be rolled on end rings into a covered wood frame curing shed. Steam again is applied, after which the pipe is moved to an open curing yard where it is kept wet until it is hauled out to the line for use.

Designed for heads from 384 to 480 ft.

The pipe on the Washington jobs was designed for heads varying from 384 to 480 ft. Recent tests on two of these pipes, one made without the exterior coating and the other having the standard ¾-in. exterior coating, resulted in the first one failing by the breaking of a strand of the wrapped wire at an internal pressure of 625 psi., equivalent to 1,450 ft. of head, and the second one failing in an identical manner at 725 psi., equivalent to 1,665 ft. of head.

Pipe made by this means attains satisfactory strength and can be handled into place in five days after completion of manufacture. The pipe is said to behave remarkably well under external loads. Tests were made to determine the strength of this pipe to support external loads, and the average of tests on five pieces of pipe by the three-edge bearing method showed that it took a load of 6,100 lb. per lin. ft. of pipe to cause a crack having a width of 0.01 in., and the ultimate load the pipe would carry was 14,700 lb. per lin. ft.

This pipe represents an advance in the art of making reinforced concrete pressure pipe although the principle of prestressing steel in tension and concrete in compression in a reinforced concrete structure is not new. It is only recently, however, that full advantage of the principle has been utilized in the manufacture of reinforced concrete pressure pipe.

Application of the principle on a commercial scale has not been simple, stated F. F. Longley, vice-president of the Lock Joint Pipe Co. He pointed out that the accomplishments of his company with this method of making pressure pipe are the result of many years of intensive study, investigation, experimentation and mechanical development.

"For high head pipe in particular it has great merit," states Mr. Longley, "resulting in an important economy in the tonnage of steel required, and resulting also in a pipe of admirable elastic qualities within the range of pressures in which it is designed to operate."

The work being done for the water department of the District of Columbia has been under the direction of J. B. Gordon, chief sanitary engineer for the District, assisted by Humphrey Beckett, superintendent of the water department, David Auld, assistant superintendent, and Roy L. Orndorff, designing engineer.

For the Washington Suburban Sanitary District, Harry R. Hall, chief engineer, Harry B. Shaw, deputy chief engineer, and R. Roland Devilbiss, construction engineer, have been in charge.

William R. Brend was engineer and superintendent for the Lock Joint Pipe Co. operations, and N. S. Myers was concrete foreman.

Box Sewer in Deep Trench Built for Flood-Control at Hartford

***Contents in Brief**—At Hartford, Conn. a large box sewer is being built in 40-ft. sections. Each monolith is constructed in two pours, the invert first being built and then the sidewalls and top in one pour. Interior forms are of a design to permit re-use many times; trench sheeting is used for the exterior forms and is left in place.*

As PART of the comprehensive flood-control program for the city of Hartford, Conn., a long box sewer is being constructed on a rush schedule. In addition to the procedure followed to attain speed, the work is of interest because of the methods used to overcome bad soil conditions and to protect existing foundations.

An article in *Engineering News-Record*, Jan. 29, 1942, p. 180, described construction of a 5,600-ft. pressure conduit of large size to car the waters of Park River throu downtown Hartford. This project, important phase of the flood-contr work at Hartford, is now neari completion, and very little addition work remains to provide comple protection for the city. Of the r maining construction, the box sew is the major job now underway.

Known as the Gully Brook Co duit, the job is 2,333 ft. long. It located along Spruce St. and Asylu Ave. in downtown Hartford. Fo much of the distance a reinforce concrete pressure box conduit provi ing a single 11 x 9½-ft. opening being used; for the remainder double box with 7 x 9-ft. openings being constructed.

The soil encountered for the mo part is a red clay becoming ver sticky when wet. Excavation is wit a clamshell bucket handled by crawler crane. Shoring is require for the full length of the sewer. Onc this protection is in place, a 3 to 6-in thick mud seal of Class C concret (1:3.35:6.24 mix) is added and th sewer built on this seal.

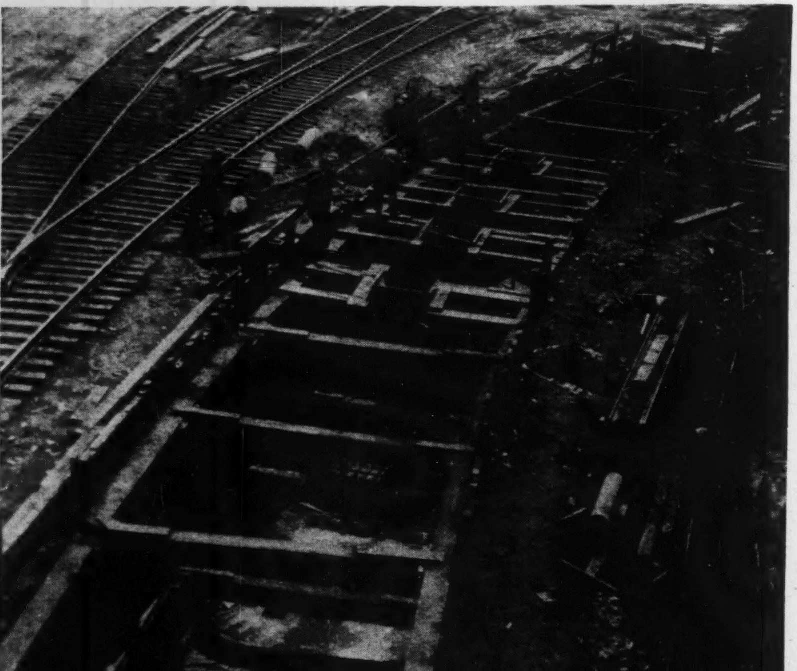


Fig. 1. A long section of the sewer was built between two lines of 4-in. thick timber shoring braced as above. Concrete for the invert was delivered by truck mixers dumping in the elephant trunks shown in this view.

Sheeted trench required

Where ground conditions an clearance permit, 4-in. thick vertica timber shoring is installed (Fig. 1) The sheeting is put down with a driv ing hammer as excavation advances Two lines of 12 x 12-in. wales are used at each side, one about 4 ft above the invert and the other roughly 6 in. above the roof level of the conduit, which places the two lines of wales about 8 ft. apart. Bracing between the wales consists of 12 x 12-in. timbers on about 10-ft. spacing along the trench.

Concrete is placed against the 4-in. timbers. After the invert is constructed, the lower wales and braces are removed and the sidewalls and roof built. Later the top bracing is removed, but the 4-in. timbers are left in place, except for the top few feet, which are cut off.

The type of shoring just describe

proving highly satisfactory and s been used where excavation as ep as 20ft. has been necessary. It ll be used for about one half of the wer job. However, at one point the wer is within a few feet of the foot- g of an overpass spanning several ilroad tracks. For 150 ft. in this ea the shoring is being constructed steel sheetpiling to minimize the ssibility of settlement. Sheetpiling ighing 22 lb. per sq.ft. was used, lers being spaced the same as with e wood sheeting and cross braces ing reduced to 6-ft. spacing at the p and 3 ft. in the bottom row.

The steel sheetpiling was driven fore start of the excavation. At me points the piling was but 1 ft. m the overpass footing. When the wer is completed in this area, the per few feet of the piling will be rned off and the remainder left in ce. The open trench will be filled th earth compacted in place.

bway shoring used to advantage

A third type of shoring known as ubway shoring" is being used in area where the excavation is as ep as 24 ft., where numerous water ins, pipelines and electrical con- its are encountered and where eet traffic must be maintained near- . This type of shoring was chosen the following reasons: (1) Mini- m settlement would result; (2) nstruction could be carried out re easily at the depth required n with timber sheeting, and (3) nimum damage to the water mains d other conduits in the immediate a would result during installation the shoring.

Along each side of the trench 10 x -in., 49-lb., wide-flange H-piles on t. centers are being driven before cavation starts. After the piles ve been driven, 4-in. thick hori- ntal shoring is inserted between the es (Fig. 4). Two lines of walers d cross braces on about the same cing as with the timber shoring e required. With this type of shor- , the work of the clamshell bucket s to be supplemented along the ges of the trench by considerable nd excavation. After the conduit s been constructed, compacted fill ll be placed over the sewer and the oring and H-piles will be removed.

The sewer is being built in 40-ft. ernate sections. Since operations the single-barrel and double-bar- portions are much the same, only

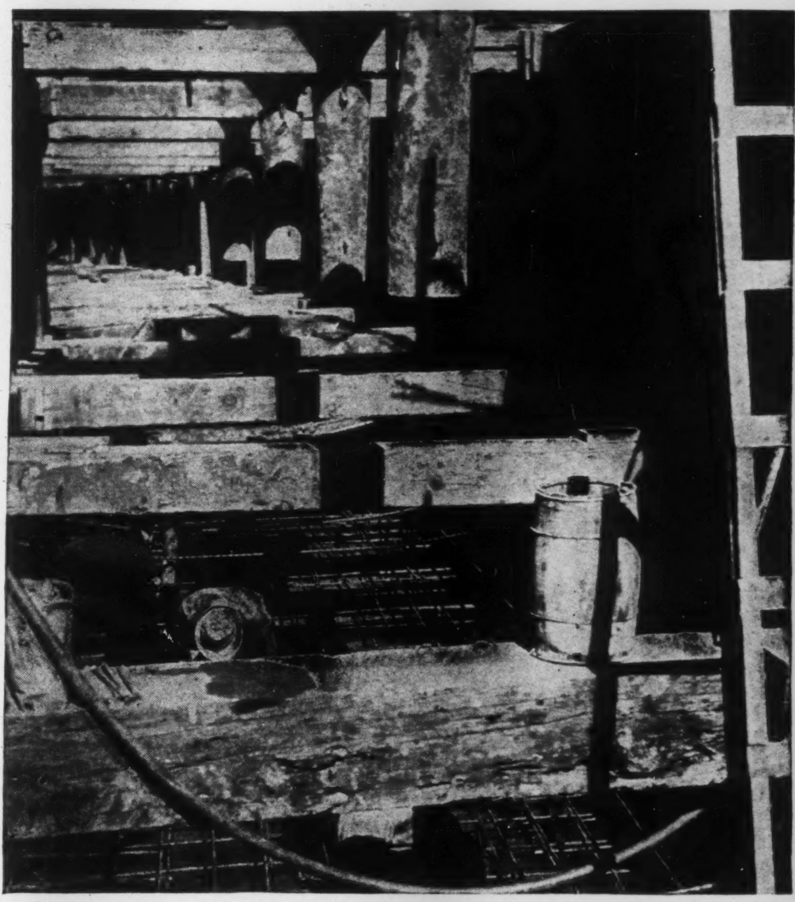
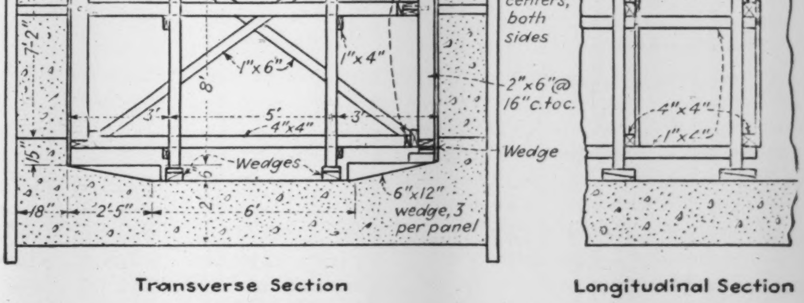


Fig. 2. Interior of the trench showing the timber bracing and the steel workers installing the invert reinforcing. The first lengths of the elephant trunks for placing concrete have been attached to the upper bracing.



Transverse Section

Longitudinal Section

Fig. 3. Forms for the interior of the sewer were designed to permit removal of the side sections, which include the support for the sloping portion of the roof, before the central roof forms were removed. Sidewall and roof panels are carried forward by hand as the work advances.

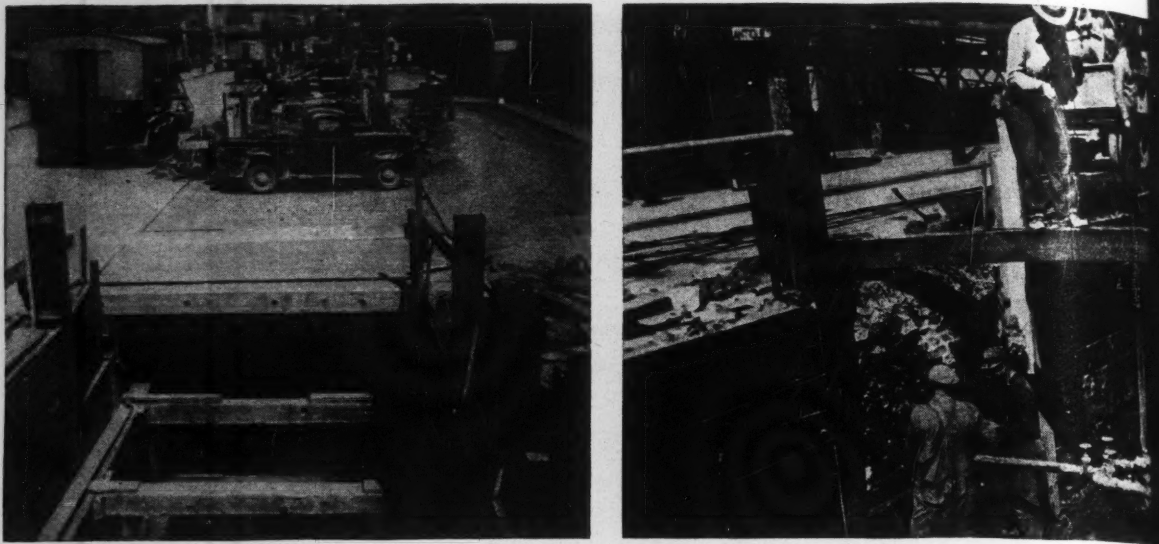


Fig. 4. "Subway" type of shoring was used along Spruce St. to minimize settlement and damage to existing pipelines a conduits. A temporary bridge over the trench, made of 12 x 12-in. timbers bolted together in units of three, provid access to the railroad station at right. Timbers are supported on a horizontal steel beam welded to the H-piles. T cut here is about 23 ft. to subgrade. Right: Horizontal timbers for the subway-type shoring often had to be left o until obstructing water mains or conduits had been removed.

construction of the single-barrel conduit will be described. A cross-section of this sewer is shown by Fig. 3. It has sidewalls of 18-in. minimum thickness, a 24-in. invert and a 20-in. top. The sewer was designed to resist a pressure head of 30 ft.

Reinforcing delivered already bent

All reinforcing steel is delivered to the job already bent. Generally the reinforcing is placed for a considerable length of the invert before concrete placing begins. This method permits the concrete for several alternate sections of the invert to be placed in one day.

A 1:1.94:3.94 concrete mix made with 1-in. maximum size aggregate and 5.5 gal. of water per bag of cement is being used, giving about a 2-in. slump. This mix is designed to produce a concrete with a 3,400-psi. compressive strength at 28 days.

Truck-mounted mixers (generally four or five are used) deliver the concrete to the point where needed. For most of the work to date, the trucks have dumped directly into elephant trunks above the conduit, but in a few places the concrete will be delivered through bottom-dump buckets handled by a crane.

The original plan was to use plywood to construct the interior forms. However, this material could not be obtained readily and the forms were built of nominal 1-in. dressed and center-matched yellow pine nailed over 2 x 6-in. yellow pine timbers on a 1-ft. spacing. The exterior surface of the 1-in. material was covered with a ⅛-in. thickness of oil-tempered compressed wood. The forms are built in panels 4 ft. wide.

The method of supporting the interior forms is shown by an accompanying drawing. This method permits the side forms to be removed within 48 hr. for use elsewhere, while the center section of the roof form can be left for the specified support period.

In placing the concrete, the usual practice is to let the sidewall concrete obtain its initial set before that for the roof is placed. This procedure requires about a three-hour wait after placing the sidewall concrete. All the concrete is vibrated.

Conduit work averaged 40 ft. daily

Ordinarily, once the concrete has been placed, the side forms are left in place about two days and the top forms for seven days. A 120-day schedule for the entire job requires that the contractor average construction of 40 ft. of conduit daily. Including that for the invert, this schedule requires an average daily concrete placement of 130 cu. yd. To meet this schedule he has constructed 320 ft. of sidewall forms (160 ft. for each side) and 320 ft. of roof forms. The form panels, both sidewall and roof, are carried forward by hand as wo advances.

In the joints between adjace 40-ft. sections, copper water stops a used, also a ½-in. thick cork fill covered with bituminous cement.

Construction started Aug. 11 a was scheduled for completion Dec. At the time this was written the co tractor was working one 10-hr. shi seven days a week, using a crew between 60 and 65 men. Equipme employed includes three crawl cranes, two truck cranes and the fo or five truck-mounted mixers pr viously mentioned.

Those in charge of the project

The $400,000 project is being do by the Providence, R. I., Distri office of the Corps of Engineers i cooperation with the Hartford Floo Commission of which C. W. Cooke i engineer. The plans for the wo were prepared by the city enginee of Hartford under an architect-eng neer agreement with the War Depar ment. For the Army, Lt. Col. E. W Garbisch is district engineer, T. S Burns is in charge of the plannin division, Robert E. Lee is area eng neer at Hartford, and H. S. Jensen i direct charge on the job.

Charles F. Vachris, Brooklyn, N Y., is general contractor. For thi firm Anthony Vachris is general su perintendent and John Vogt is eng neer.

Trashrack Design That Prevents Clogging

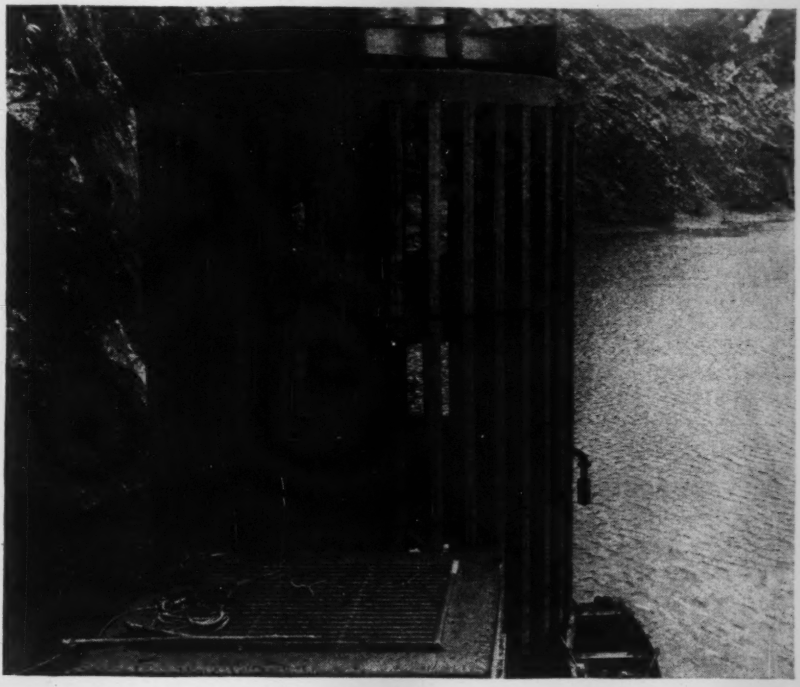
TRASHRACKS designed to function without risk of clogging despite the accumulation against them of large quantities of debris, have now given satisfactory service for several years at headworks operated by the Los Angeles County Flood Control District. Prior to the development of an improved design, in which the width of openings between rack bars increases in a downstream direction, racks of ordinary design were used. They were always unsatisfactory because debris would lodge in the bar openings and then on the racks each time they were exposed. Frequently the flow of water would be entirely choked off. The method by which this situation was successfully remedied is outlined in the following.

There has been a great deal of experience with heavy debris movement in mountain terrain included in the Los Angeles County Flood Control District. The San Gabriel mountain range includes heavily wooded areas, the streams have a steep regimen and there are heavy runoffs which bring down great quantities of debris. Floating debris sometimes completely covers the surface of a reservoir for considerable areas unless restrained by booms at vantage points selected with reference to prevailing winds.

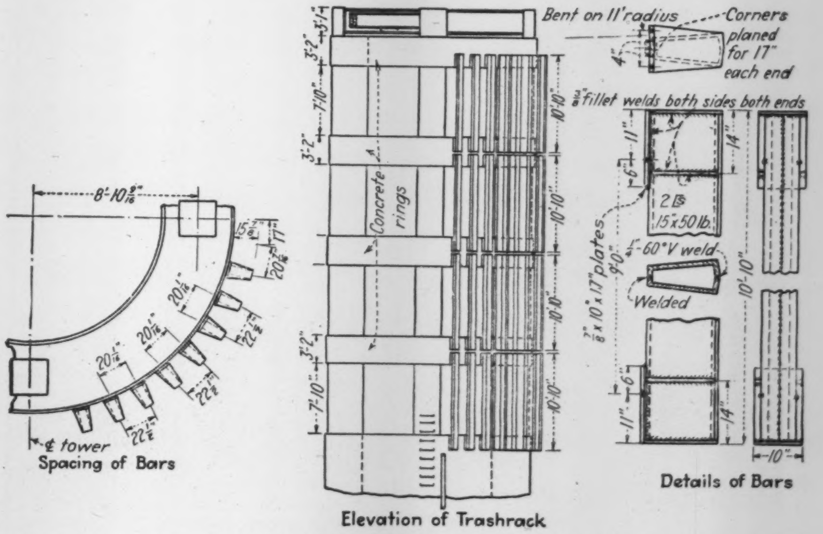
After unfortunate experience with trashracks of the ordinary type, it was decided to design racks that would have (a) a progressive increase in width of opening between bars in a downstream direction, (b) ample area of opening and (c) strength enough to withstand the water pressure accumulated behind a large quantity of debris forced against the racks by the outflowing current.

If the reservoirs could have been operated with trashracks always submerged, the danger from floating debris would have been lessened. However, various reasons necessitated draw-down of water level from time to time and the debris menace was always present. Even with a full reservoir, after debris has been long afloat, some of it became waterlogged and was drawn down against the trashracks by outflowing current.

As in most installations, the Los Angeles County trashracks are the outermost protection at each intake. If they get clogged there is no simple way to free them. In some cases the only other reservoir outlets are spillways, not useful for draw-down, and pipelines through the dam, of rela-



Tower trashracks of improved type designed to eliminate the clogging that made the old rack in the foreground ineffective.



Spacing of Bars

Elevation of Trashrack

Details of Bars

Details of a trashrack designed to prevent clogging. Increasing the width of the bar space back of the face is an important feature of this design.

Debris accumulations that frequently clogged and wrecked old style trashracks.

tively small capacity. Under these conditions and with heavy debris accumulations a regular occurrence, a better type of rack was a necessity.

The essential feature of the improved design is a heavy steel bar, made of two 15-in., 50-lb. channels, which are cut down on one side and then welded together for their full length. The result is a bar of great strength, wider along one edge than on the other. Placed in a row with their wider edges upstream, these bars make a rack in which openings continually widen in a downstream direction. Anything that can get through the initial spacing can go on with little risk of blocking the passageway.

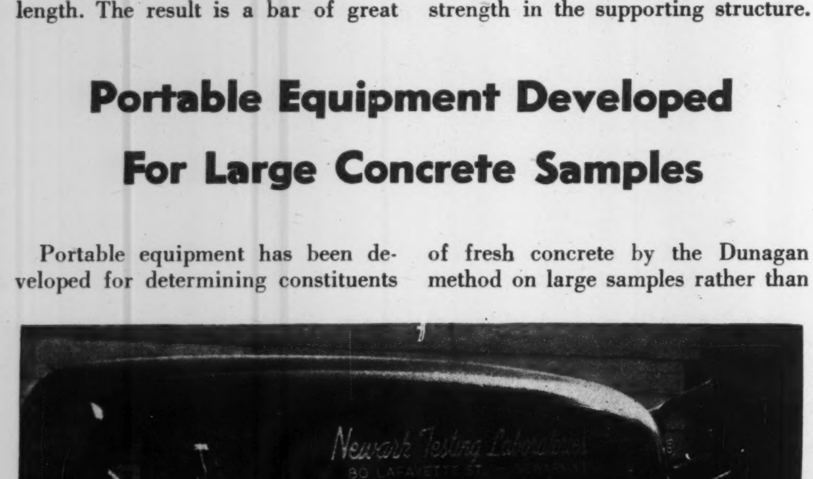
It is necessary to provide ample strength in the supporting structure. The cylindrical design shown in the accompanying drawing, used at San Gabriel Dam No. 2, makes use of a series of circular concrete ribs thus reducing the necessary length of trashrack bars to 10 ft. 10 in. Each bar is securely bolted at top and bottom to the supporting concrete rib and there are no transverse bolts or other obstructions across the waterway between adjacent bars.

Since this design has been in use there has been no further trouble from debris clogging the intakes. As a nuisance in the reservoirs, floating debris still has to be controlled as much as possible by booms and burned on shore at appropriate seasons.

The improved trashracks were developed under general supervision of H. E. Hedger, chief engineer, Los Angeles County Flood Control District, prior to his joining the armed forces. W. E. Salsbury is acting chief engineer. The work was prepared under direction of Paul Baumann, assistant chief engineer, with W. B. Ream, chief designer.

Portable Equipment Developed For Large Concrete Samples

Portable equipment has been developed for determining constituents of fresh concrete by the Dunagan method on large samples rather than the 3,000-gram sample of the usual laboratory device. The method requires the weight of the concrete sample immersed in water and the weight of the coarse and fine aggregate separately after the cement is washed out.



By use of a tight washing box manually rocked, large concrete samples can be quickly tested for evaluation by Donagan method.

The equipment, which was developed by Newark Testing Laboratories, Newark, N. J., is shown in the accompanying photograph.

The 30-lb. scale on the tripod and the bucket, which can be immersed in the larger can, give the required weights. Instead of manually shaken No. 4 and No. 100 laboratory screens, of only 8-in. dia., the washing box shown is used with pressure nozzles over No. 4 and No. 100 screen cloth. The box can be tightly closed and manually rocked to give complete separation into coarse aggregate retained on the No. 4 screen, fine aggregate retained on the No. 100 screen and cement carried away with the wash water. Fine and coarse aggregates are then weighed immersed, surface dried and weighed in air; computations then determine the constituents of the mix.

The large sample and the use of the tight container make possible a quicker and more accurate analysis of the concrete.

Prevention and Control of Cracking In Reinforced Concrete Buildings

W. S. Merrill
Ebasco Services, Inc., New York, N. Y.

Contents in Brief—*The use of control joints successfully eliminated unsightly patterns of shrinkage or expansion cracks in reinforced concrete walls and parapets of two recent power station buildings. Wood strips tacked to the forms left wedge-shaped joints 1¼ in. deep in both the exterior and interior faces of the walls. Procedure and sequence of placing the concrete in the walls were also important in assuring effective functioning of the control joints.*

DURING THE PAST TWO YEARS, because of the shortage of structural steel, our company has turned increasingly to the use of reinforced concrete for power plant buildings, both hydro and steam, which it has designed for its clients in this and foreign countries (including Central and South America and Russia). One of the principal difficulties incident to such design has been the prevention of cracks, or at least the control of their location, particularly in large areas of reinforced concrete walls and in parapets. How this crack problem was solved on two recent jobs, the West Junction station of the Houston (Tex.) Lighting & Power Co., and the Harvey Couch station of the Arkansas Power & Light Co., near Stamps, Ark., is outlined in the following.

The use of large areas of reinforced concrete walls, such as were adopted at West Junction, made it necessary to give careful consideration to means of preventing or controlling the location of cracks, which are often seen in concrete structures. Since it is uneconomical and impractical to provide a sufficient amount of reinforcement to prevent cracking entirely, especially those cracks that start at the corners of openings for doors, windows, or louvres, it is desirable to control the location of the cracks. Fortunately, this can be done, by providing "control joints" in the walls at proper intervals.

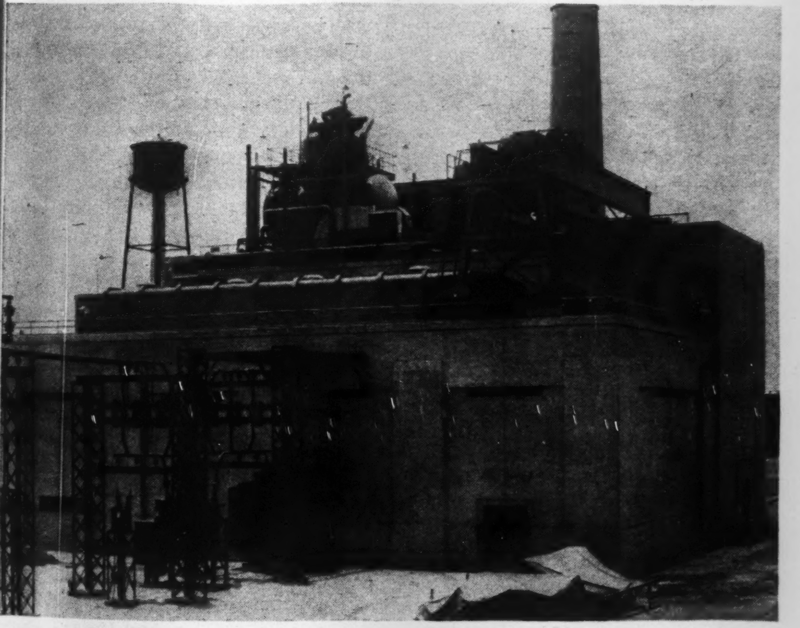


Fig. 1. West Junction steam-electric station, Houston, Tex., where control cracks in the east side wall and north end wall have prevented the development of unsightly crack patterns.

Such construction was used in the walls of the West Junction station and the joints can be seen extending from the top of the parapet wall to the ground line in the middle of the panels on the east wall of the building (Fig. 1). Similar joints in the panels on the north end of the building can also be seen. In the east wall of the auxiliary bay, above the roof line of the turbine basement, control joints can be seen above and below the louvre openings. These joints have been effective to date in controlling the location of cracks and in preventing the development of cracks in irregular patterns and in locations where they would be particularly conspicuous and objectionable. The West Junction plant has not gone through a cold season since its construction, but it is believed that the control joints will be equally effective in controlling cracks during the coming winter. Such has proved to be the case in many other structures throughout the country.

Numerous ways have been devised for forming control joints, depending upon the materials available and the job conditions. A common way of making such joints is by tacking wooden or rubber strips to the inside of the forms. After the removal of the forms and the wooden strips, a narrow, vertical groove is left in the concrete on the inside and the outside of the walls. The wooden strips are usually 1¼ in. deep and are wedged shaped, the thickness at the face of the wall being ¼ in., while the thick-

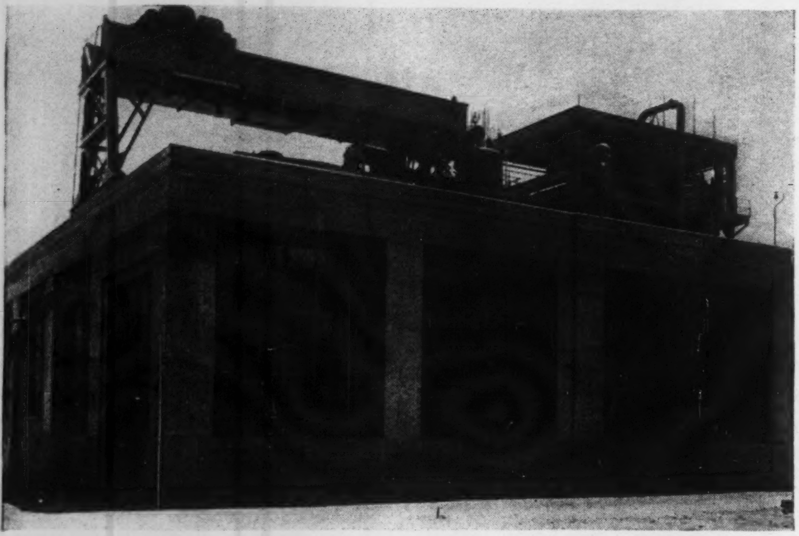
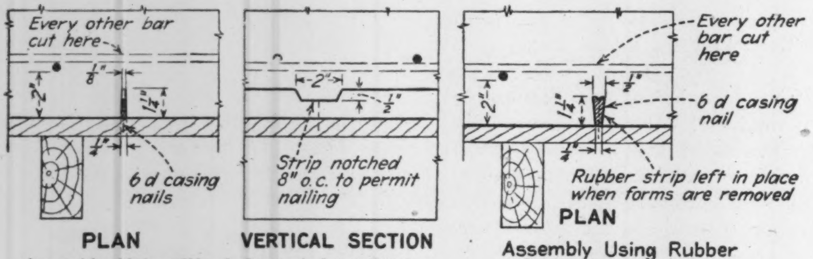


Fig. 2. Harvey Couch steam-driven station, Stamps, Ark., in which control cracks were placed in the base course and parapet.



Every other bar cut here
1/8"
2"
1 1/4"
1/4"
6 d casing nails
PLAN
2"
1/2"
Strip notched 8" o.c. to permit nailing
VERTICAL SECTION
Assembly Using Wood Control-Joint Strip
Every other bar cut here
1/2"
2"
1 1/4"
6 d casing nail
1/4"
Rubber strip left in place when forms are removed
PLAN
Assembly Using Rubber Control-Joint Strip

Fig. 3. Form assembly showing how control cracks are formed by wood or rubber strips. Wood strips were used on the buildings described in this article.

ness at the inner edge is $\frac{1}{8}$ in. Rubber strips are of the same shape except that they are wedged in the opposite direction, the inner edge being $\frac{1}{2}$ in. thick instead of $\frac{1}{8}$ in. for the wooden strips. The rubber strips are left in place in the wall and no caulking of the joint is required. On the two jobs described herein, wooden strips were used, these being of the dimensions shown by Fig. 3. A rubber strip detail is also shown for comparison.

The narrow grooves made in each side of the wall by the wooden strips, and the breaks made by the rubber strips, pre-determine the location of the cracks through the wall, thereby relieving the stress in it. One-half of the horizontal reinforcement is stopped off or cut at the joints to facilitate cracking at those places. Another way of making an inconspicuous control joint is by attaching a lead-coated copper strip to the reinforcing bars in such a manner that it will be firmly supported and so that the narrow edge of the strip will be against the forms and consequently flush with the finished surface of the wall. Only the narrow line of non-corrosive metal appears on the surface of the wall, and no caulking is required.

Study of Fig. 1 will show that the control joints in the east wall of the West Junction building extend from the top of the parapet to the ground line. Actually they extend entirely through the base course of concrete to the top of the parapet and down the inside of the wall. On the outside of the wall the control joint is filled to a point about $\frac{1}{4}$ in. below the surface with a non-staining, concrete-colored caulking compound, to prevent penetration of moisture and to seal the joint effectively. The result is that the joint is fairly inconspicuous and not at all unpleasing. In selecting a calking compound it is essential that only such compounds should be used as are definitely known to be non-staining and which retain their plasticity and adhere tightly to the sides of the joint. Some compounds apparently contain oil, which will stain the concrete adjacent to the joint, and these should be avoided.

No exact rules for the location of joints can be made. Each job must be studied individually to determine where joints should be placed, taking into account the exigencies of structural design. It has been demonstrated in practice that control joints should be spaced not more than 20 ft. apart in walls with frequent openings, and never more than 25 ft. apart in solid walls, to be most effective.

The effectiveness of the control joints in preventing irregular cracking at West Junction, by localizing the cracks in a predetermined location, was doubtless increased by the construction procedure used in placing the concrete in the columns and walls. A description of the various steps in placing the concrete will help to explain this.

The base course shown by Fig. 1 is 7 ft. 2 in. high above the footing, and was placed with one horizontal construction joint located 2 ft. 3 in. above the footing. The top 5-ft. portion of the base course is somewhat thinner than the section below, and this provided a natural location for the horizontal construction joint. After the base course had been placed, the next step was to complete the columns. It will be seen that the top of the columns is some 5 ft. below the top of the parapet wall. Following completion of the columns, the next step was the construction of the thin walls to the level of the top of the narrow openings, which are located about 4 ft. below the top of the columns. Following the completion of the walls to this elevation, the remainder of the walls between and above the columns was completed. The placing of the various sections of concrete in the manner and sequence indicated allowed the various sections to shrink before new concrete was placed against them. This is especially desirable where thinner sections of concrete are tied to heavier sections, such as base walls and columns.

In addition to the horizontal and vertical construction joints mentioned, the prevention of cracking at the corners of door and louvre openings was further facilitated by the manner of concrete placement. In the case of the large door opening at the rth end of the east wall, and also in e case of other similar openings, e concrete was placed in the wall p to the top of the opening and al- wed to set and shrink for two to ree hours before continuing with e work above it. Continuous plac- g of the concrete from the base urse to the top of the wall above the or would have resulted in a settle- ent of the concrete to the right and ft of the door greater than that over e door, and this quite certainly ould have caused unsightly cracks. he short time required for settlement and shrinkage of the concrete up to the top of the door opening did not result in a visible horizontal construction joint. Such stops are sometimes referred to as pour joints or pour stops.

The Harvey Couch station, (Fig. 2) is similar in size and layout to the West Junction station, but in this structure while the frame is of reinforced concrete the wall panels are of brick, with large metal sash windows. Because of the type of construction used in this building, the control joints required are of limited extent. As indicated in Fig. 2 they are used in the base course under the center of each window and also in the parapet wall over the center of each window. They are not carried through the heavy beam above the window.

On this station the base course was placed in one section vertically, and the columns were then completed to the concrete beam above the windows. Similarly, the interior concrete columns were placed to such a level that the exterior and interior roof beams could be placed as a monolithic structure.

Simple Timber Truss Designed To Support Girder Forms

he intake structure for the Pit River o. 5 tunnel recently built by the acific Gas and Electric Co. in north- rn California includes a concrete am in which there are four open- gs for gates each 50 ft. wide. These penings are spanned by concrete irders extending from pier to pier bove the gates. The girders support nd guide the control gates and also arry the structure in which the gate perating mechanism is housed.

Girders were chosen because the 0-ft. spans are too long to permit of conomical beam design. Falsework n which to build the girders, how- ver, could not well be in the form f a trestle in certain bays because f the hazard from trees and other ebris floating down in the stream; or in other bays because there the restle would interfere with erection f the gate steel. The temporary di- ersion works had been abandoned efore high water of the winter and rior to construction of the girders nd superstructure over the gate open- ngs. A solution of the falsework roblem was found in the simple mber truss shown in the accompany- g illustrations.

As the girders had to be about 10 . in depth, the weight of the fresh oncrete was calculated to impose a otal load on the falsework in each pan amounting to about 360,000 lb. r 90,000 lb. on each of the four rames made of 12x12-in. timber. Details of connections and arrangement of bolting at the joints are hown in the accompanying drawing.

Maximum computed deflection of the loaded truss was $\frac{3}{16}$ in. When the truss was carrying its full load no deflection could be detected when sighting by eye. This was a point decidedly in favor of the timber falsework used as compared to deflections that could be expected if steel plate girders had been used. Computations were made for the steel girders because such girders happened to be available.

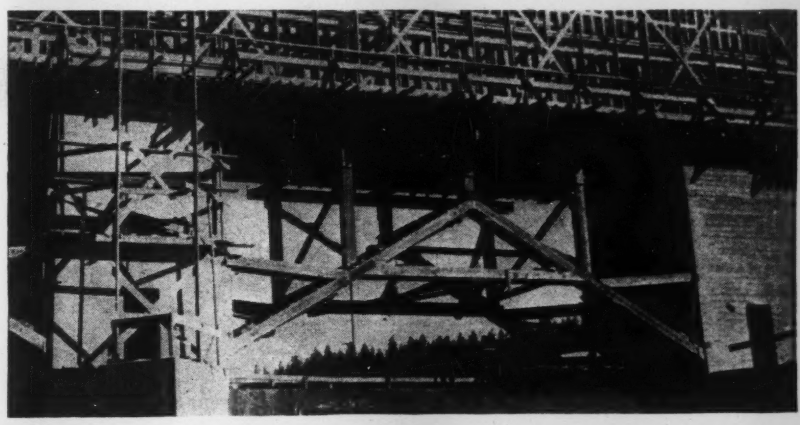


Fig. 1. A timber truss of 50-ft. span, serves as falsework under the concrete. girders between the piers of a dam.

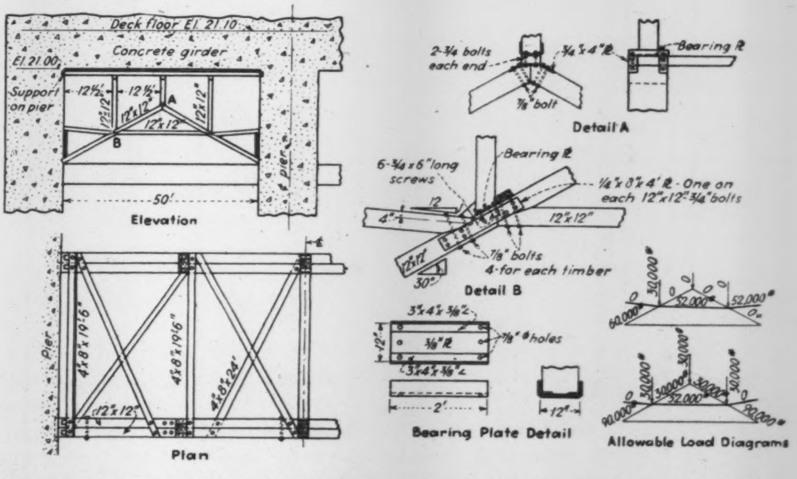

Deck floor El. 21.10
Concrete girder
El. 21.00
Support on pier
12½'
12½'
12"x12"
12"x12"
12"x12"
12"x12"
A
B
℄ pier
50'
Elevation
Pier
4"x8"x19'-6"
4"x8"x19'-6"
4"x8"x24'
12"x12"
℄
Plan
2-¾ bolts each end
¾"x4" ℞
⅞" bolt
Bearing ℞
Detail A
6-¾ x 6" long screws
Bearing ℞
¼"x8"x4' ℞ - One on each 12"x12" ¾" bolts
12
4"
12"x12"
12"x12"
⅞" bolts 4 for each timber
30°
Detail B
3"x4"x⅜" ∠
⅜" ℞
⅞" ϕ holes
12"
3"x4"x⅜" ∠
2'
12"
Bearing Plate Detail
30,000#
0
0
0
0
52,000#
52,000#
60,000#
0
30,000#
30,000#
30,000#
30,000#
30,000#
52,000
0
0
90,000#
90,000#
Allowable Load Diagrams

Fig. 2. Principal features of the timber supports for the forms for the girders.

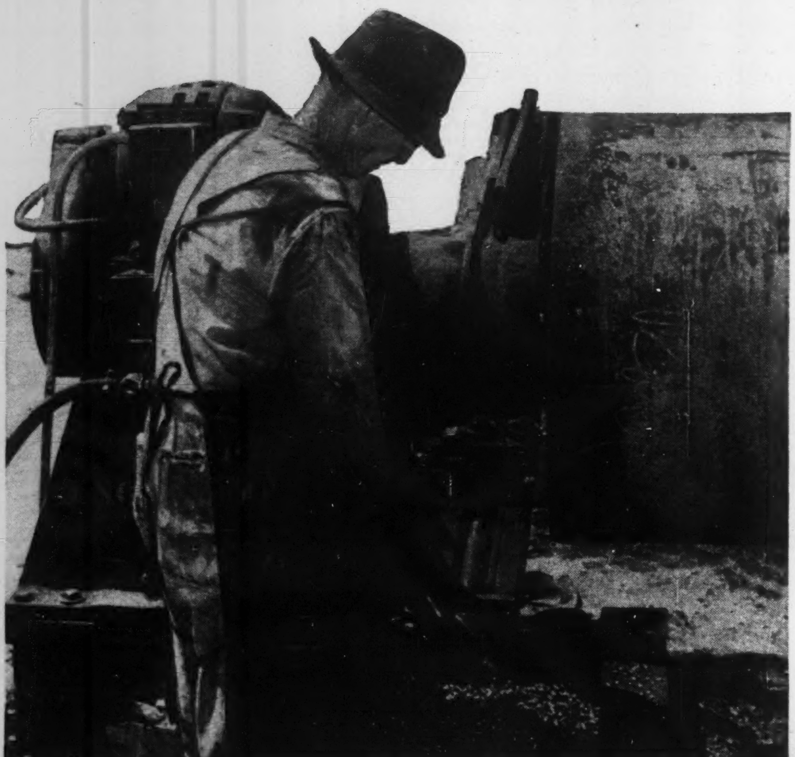


Fig. 1. Squaring and truing the pi ends on a "vertical milling machin assembled for this purpose.

Improved Method Used To Salvage Big Steel Pipe

Contents in Brief—*After 10 yr. of service a 36-in. water line was recently dug up, its 30-ft. sections are being cleaned (by burning and shot-blasting to remove old coatings), then trimmed, trued, rerolled and repaired. Finally, over an enamel coating, a "brush-coating machine" applies two coats of shotcrete to the exterior.*

RECONDITIONING the 30-ft. sections of a 36-in. pipeline that had served the city of Pasadena for 10 yr. and was no longer needed, is a wartime expedient that has provided 90 percent of the pipe for a much needed water main extension from Santa Ana to Corona del Mar at the southernmost tip of the Metropolitan Water District's system. This reconditioning job, with the problems it presented and the solutions worked out to solve them, sets an example typical of the patriotic rule that for the duration we "do with what we have."

As pipe sections were dug from the trench they were trucked to the reconditioning yard on the southern outskirts of Los Angeles and stored near the starting point for the plant operations which include cleaning, trimming up, rerolling, re-belling, shot-blasting, welding up any worn spots (such as pit marks), applying enamel coatings inside and out and, finally, applying by mechanical means, two exterior coats of shotcrete.

The work was scheduled for completion in a four-month period, with about 150 men employed in reconditioning operations. The last sections were dug from the trench late in July and laying of the new line was practically completed at the end October.

The first step in the reconditionin yard is to remove the original pr tective coating. This has to come o because while still good in som spots, the nine years of service ha caused deterioration on both insid and outside coatings, thus making desirable to provide a new and uni formly good protective coating on th entire length of the pipe, amountin to about 56,000 ft.

Old coating burned off

Most of the old coating is remove by burning in fires started and maintained with the aid of distillate spray delivered from pipe nozzles. Durin the burning process the pipe is rolle on metal supports as necessary t keep the fire moving along the coating and particularly to prevent "ho spots" in which heat might be s great as to damage the metal. Further control is provided by a wate hose which the foreman uses to chec the flames when they threaten to exceed desired limits.

Burning on the inside is starte with the distillate spray while th pipe is still hot from the first burning. The coating residue is knocke off by hand as thoroughly as is practicable after the pipe has cooled, an remnants that adhere persistently ar left for removal by the shot-blastin operation that comes later.

The cutting torch is used on al pipe sections for removal of the spigo ends and rough squaring up of one end of the 30-ft. sections. In this operation, also, all ends that were laid at angles in the original line, regardless of the degree of bevel, are cut off and roughly squared. The sections are then ready for the "vertical milling machine" that accurately squares the pipe ends. This is done with a motor-driven arm on each end of which has been mounted a cutting tool similar to that used in a milling machine. This tool squares the pip end after the section has been placed n a mandrel which expands to eady and support the section at the esired height in front of the milling achine. Later a compressed air rinder is used to smooth off any urr that remains on the inside or utside of the pipe after completion f the milling operation.

About one-third of the sections reuire rerolling by reason of being ut of round, dented or slightly bent. set of rolls such as was used for nitial curving of the plates, is emloyed in this operation and the reolling has been quite generally sucessful. Considerable skill on the art of operators is required and even the rerolling is sometimes a tedious peration.

New spigots welded on

After rerolling, a new spigot ring welded on one end of each section. hese rings are exactly sized and haped on a hydraulic press and are ut on with particular care to mainain exact alignment. On all pipe ections whose plate thickness is $\frac{5}{16}$ n., two welds are used, one inside nd one outside.

All sections are given end-truing reatment and pressure molds are sed for reforming the bell ends. In machine developed expressly for ell reforming, the bell is first expanded to approximately the desired ize, then a yoke is placed around the ell for forming the lip which is pressed out in a second operation. The body of the bell is then expanded to the correct size. Occasionally, where the original welds were not up to requirements, the re-belling operation did some damage, requiring the section to be repaired and the re-belling repeated. All sections are tested under hydraulic pressure to prove all old and new welds.

Cleaned by shot blast

All sections are shot-blasted, going over the pipe twice both inside and out to secure a clean, sharp surface. On the interior the shot-blast is spread uniformly by use of a nozzle that travels through the section.

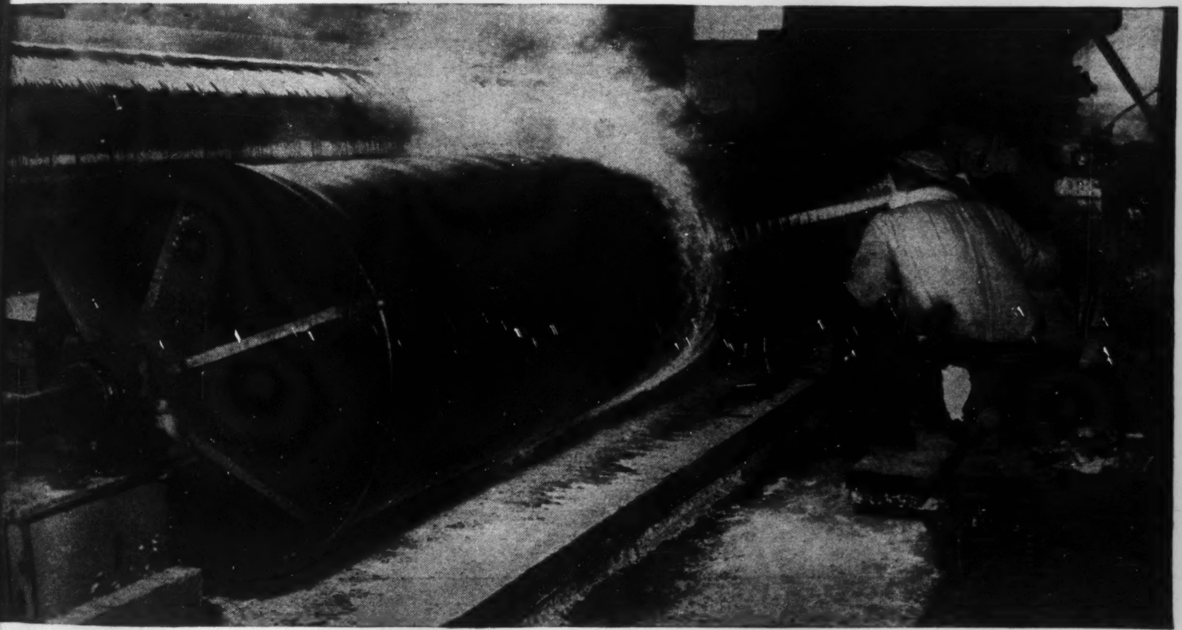
After the shot-blasting it is possible to decide on the extent to which repairs to the metal are necessary. Much of the line was originally installed in well-drained, sandy soil where very little corrosion was expected. Near some of the field joints and under field-applied coating, some serious corrosion had occurred and pittings may have been as deep as $\frac{1}{8}$ in. in a few cases. Most of the pitting has been found on the outer surface. An inspector encircles with chalk all spots that are to be built up by welding. After the welding the added metal is ground down to the thickness of the adjoining plate.

After a coal-tar priming coat, coal-tar enamel is put on both interior and exterior surfaces. For the interior lining, two troughs containing hot enamel are thrust into the slowly rotating pipe section from opposite directions. Each of these troughs extends half way through the section and they are tipped over and emptied simultaneously, thus avoiding any unevenness at the juncture point.

The exterior coating is applied in a jet delivered from a carriage moving lengthwise of the section. The speed of rotation and rate of application in this treatment is very carefully regulated so that the desired coating can be put on in one round trip of the moving carriage. Recognizing that effectiveness of the enamel depends upon perfection in the coating, the greatest care is given to this operation and considerable retouching is done after the high voltage brush tests are made.

Shotcrete protective coat

Specifications for the sections to be relaid require an external protection of shotcrete in which a welded steel wire mesh is embedded as reinforcing. During the earlier part of the reconditioning, crews using two of the ordinary hand-directed machines for applying shotcrete, turned out as much as 25 sections per day, putting on first a flash coat, then the welded mesh and over this the second shotcrete coat. In this operation one-half the circumference of the sections was covered at one time, then



ig. 2. Application of enamel coating to the outside of the pipe followed numerous preliminary steps of reconditioning.

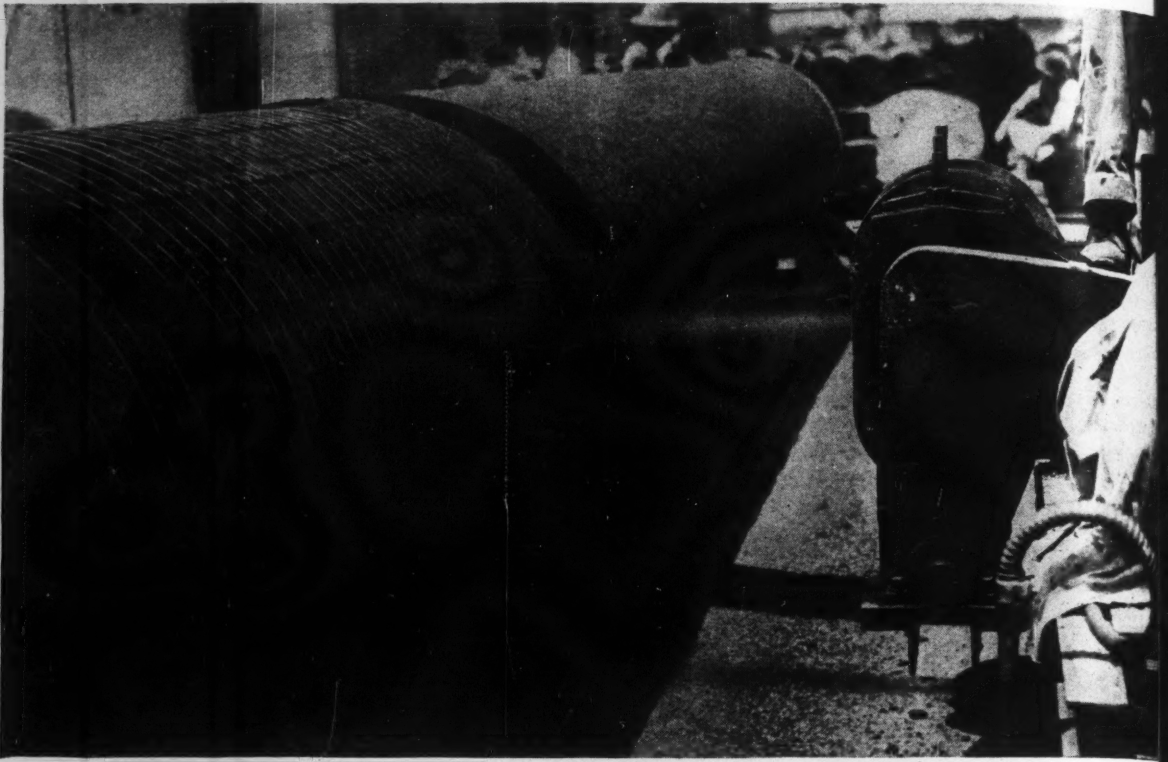


Fig. 2. A "brush-coating machine" applies a second layer of shotcrete over the mesh placed on the first shotcrete layer. With this machine a more uniform mortar coating is obtained than is possible with a hand-operated nozzle.

the sections were turned and the other half was completed.

An automatic device called a "brush coating machine" was used for applying the shotcrete during the latter part of the job. Believed to be the first time this machine has been used for covering a smooth-surfaced pipe, some time was required for adjustments.

The "brush" part of the name comes from two cylindrical brushes that rotate just outside a nozzle through which shotcrete is forced, in the form of a jet, against the rotating pipe section. The advantage claimed over the hand-operated nozzle for applying shotcrete is the constant distance of the nozzle from the rotating pipe section and the accurately regulated rate of travel of the machine carriage parallel to the pipe diameter.

With this equipment, properly regulated to requirements, it is claimed that a mortar coating can be applied in an extremely uniform manner with somewhat less moisture content than that of shotcrete put on with the hand-operated nozzle.

A flash coat of mortar about $\frac{1}{4}$ in. thick is put on the enameled pipe surface prior to wrapping on the welded steel mesh. This flash coat was considered necessary to protect the enamel because wrapping the mesh directly over the enamel would be likely to penetrate the protective seal.

The dryness of the mix makes it possible to put the steel mesh over the first coat immediately after rotation of the section stops. Workers put on the layer of fabric, already cut to exact dimensions, and twist wires along the contacting edges of the sheet until a close fit is effected and the two edges are firmly joined. Then, to take up all slack and insure a snug fit against the first coating, the steel mesh is drawn more snugly against the first coating by using pliers to put one or more rows of kinks in some of the circumferential wire runs. The amount of this kinking required varies with the snugness of fit along the adjoining edges. The objective is to make sure that the welded mesh fits snugly to the first coat of shotcrete.

The brush-coating carriage completes one round trip along the pipe length for each layer of mortar after having received a load of carefully prepared mix just prior to the start of each trip. The operator has means of accurately controlling speed of travel of the machine carriage. The need for adjustments in the machine and its operation at the outset was only natural in view of the fact that there was no precedent for application to an enameled surface and of course all the operators had to be specially trained.

Because it is desirable to remove the sections immediately after the machine operation is finished, slings of belting are used for lifting them with a crane. The sections remain in a curing yard where they are kept damp by sprinkling for 14 days.

Removal of the old pipe sections from the trench; hauling, reconditioning and laying them in the new trench at the new location was done by the American Pipe & Construction Co. (H. H. Jenkins, vice-president in charge of construction; F. F. Jenkins, general superintendent) under contract from the Metropolitan Water District of Southern California, Julian Hinds, general manager and chief engineer; R. B. Diemer, chief operation and maintenance engineer.

Impact Tests on a Railroad Bridge

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Contents in Brief*—Extensive tests were made on a Pennsylvania R.R. bridge to determine the static and dynamic effects on a ballasted, con-crete decked girder span, of electric and steam locomotives running over a wide range of speeds. Impact stresses determined by electromagnetic strain gages attached to the girder flanges were found to be considerably below design requirements of the A.R.E.A. specifications. Results show that he steel girders and concrete deck slab function as composite beams, de-pending on the proper bond between steel and concrete.*

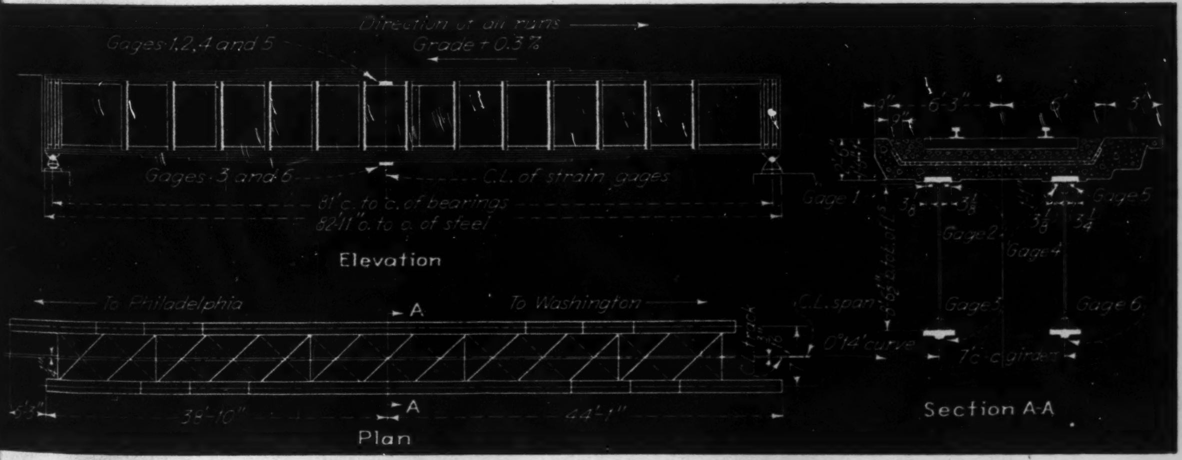
N CONTINUING an investigation to etermine impact stresses in bridges, he Pennsylvania R. R. has conducted xtensive tests on a single-track, eck-girder solid-floor bridge at lkton, Md., using both steam and lectric locomotives. A report on hese tests has been published by the mpact Committee of the American Railway Engineering Association (*Bulletin* 439, June-July, 1943) and rom this following information is ondensed. Previous tests were made n girder bridges of 122-ft. and 56-ft. pan, having ordinary open-deck loors (*A.R.E.A. Proceedings*, 1941, . 394, and noted in *ENR*, March 20, 941, p. 443). The Elkton Bridge, hown in Fig. 1, has a span of 81 ft. . to c. of bearings, with girders 83 t. long, 8 ft. 6½ in. deep over flange ngles, and spaced 7 ft. apart. Each girder has a web 102x½ in.; four cover plates, top and bottom, 18x⅝ in.; and two flange angles, top and bottom, 8x8x⅝ in. Upon the girders rests a 13-in. concrete slab having curbs to retain the stone ballast, which is 9 in. thick under the ties. The dead load is 4,770 lb. per ft. of track for the deck, and 730 lb. for the steel; a total of 5,500 lb. Other general particulars of the span are noted in Table I.

Tests made with five locomotives

Five locomotives were employed for the tests: two electric locomotives of 4:6:4 and 4:6:6:4 types, weighing 198 and 231 tons, respectively; two steam passenger engines of the 4:6:2 type weighing 157 and 169 tons, and a 194-ton steam freight engine of the 4:8:2 type. Stresses and deflections were measured in each girder at speeds ranging from 5 m.p.h. (practically static loading) up to 110 m.p.h. for the electric locomotives, 99 m.p.h. for the steam passenger locomotives, and 76 m.p.h. for the steam freight engine. Three electromagnetic strain gages were placed at the center of each girder; two under the top flange and one on the bottom flange.

In general, there was an increase in impact effect with increased speed, but this increase was moderate, except for one of the steam passenger engines. The impact values in Table II are averages of five of the maximum effects recorded for each locomotive. For comparison, the impact effects under the same locomotives on the bridges having open-deck floors are shown in this table, together with the impacts specified by the A.R.E.A. in its design specifications and its rating rules for existing bridges.

In addition to the total dynamic effects, study was made of the magnitude of the individual effects making up the total live load plus impact effect. The report on these individual effects may be summarized as follows:



ig. 1. **Impact tests were made on this 81-ft. span steel girder railroad bridge carrying a ballasted concrete deck. Results ere recorded for five different locomotives traveling over a wide range of speeds.**

TABLE I—DESIGN DATA FOR SOLID-DECK GIRDER BRIDGE

	Per Girder Steel only	 Composite
Gross moment of inertia at center	384,830 in.^{4}	720,000 in.^{4}
Gross section modulus at center	7,160 in.^{3}	8,749 in.^{3}
Stiffness factor, I/L	396 in.^{3}	794 in.^{3}
	Lower Flange Stresses	
Dead load stress	3,780	3,100
Cooper's E–10 stress	920	760
" E–72 stress	6,620	5,470
" E rating (gross section)	93	119
Stress for 1,000 lb. at center line of girder	34	28
Stress for 1,000 lb. per foot of girder	1,370	1,130

TABLE II—COMPARISON OF IMPACT VALUES ON GIRDER BRIDGES

Locomotives	Average Speed (m.p.h.)	Recorded Impact (Per Cent) Average	 Max.	A.R.E.A. Impact (Per Cent) Design	 Rating
Solid-deck Bridge; 81-ft. span					
Electric, 4–6–4	86	14	15	31	24
Electric, 4–6–6–4	82	14	15	31	21
Steam, pass. 4–6–2	88	39	42	66	61
Steam, pass. 4–6–2	83	21	22	66	55
Steam, freight, 4–8–2	72	21	25	66	59
Open-deck Bridge; 122-ft. span					
Electric, 4–6–4	89	26	27	28	24
Electric, 4–6–6–4	98	18	20	28	22
Steam; pass. 4–6–2	86	29	30	45	52
Steam; freight, 4–8–2	70	28	32	45	47
Open-deck Bridge; 56-ft. span					
Electric; 4–6–4	80	49	55	39	32
Electric; 4–6–6–4	90	39	46	39	32
Steam, pass. 4–6–2	72	59	68	88	67
Steam, freight, 4–8–2	57	35	42	88	63

TABLE III—RECORDED AND CALCULATED STATIC STRESSES*

Locomotives	Ave. Recorded Stress	Ave. Steel Only	Calculated Stress Composite
Electric; 4–6–4	3.41	4.55	3.74
Electric; 4–6–6–4	3.18	4.27	3.50
Steam, freight; 4–8–2	4.30	5.52	4.53
Steam, pass.; 4–6–2	3.35	4.63	3.80
Steam, pass.; 4–6–2	3.85	5.12	4.20

*Stresses given in kips per sq. in.

The static stresses recorded at 5 m.p.h. were considerably below the calculated static stresses if the concrete deck carried none of the stress, but only slightly below stresses calculated on the basis that the concrete deck and the steel acted as a composite beam.

The ratio of the recorded to the calculated stresses varied from 0.72 to 0.78 for the steel section only, and from 0.88 to 0.95 for steel and concrete acting integrally. A further reduction of 3 percent in the calculated stresses results if the rail is taken as a continuous beam on an elastic support; that is, a condition of uniform loading rather than a series of concentrated loads.

Effect of vibration

Vibrations in the span were induced by the electric locomotives, although there were no periodic disturbing forces set up by unbalanced wheels. Of this impact effect, termed "track effect", the greater part is ascribed in the report to irregularities in the track surface or wheel treads. For the combined track and hammer-blow effect of the steam locomotives, the measured values are well below the calculated values, but the latter are based upon the damping factors in open-deck spans, which are much less than those of the solid-deck span with its increased stiffness and higher frequency. An increase in stress due to speed, termed "speed effect", distinct from the vibrations developed by moving loads, was found throughout the tests, but its maximum effects were only 5 to 6 percent.

Oscillation raises stresses

Measurements usually showed an increase in stress in the steel under one rail, with a corresponding decrease under the other rail. This change, termed "roll effect", is due to oscillation of the spring-borne weight of the locomotive about a longitudinal axis. It was well below the provision of the A.R.E.A. specifications and rating rules.

Static stresses under all the locomotives were calculated in two ways for both girders for comparison with the recorded stresses: (1) by using the gross moment of inertia of the steel section only, and (2) by using the same moment of the composite concrete and steel section. Average results, summarized in Table III, are given in kips per sq. in.

Concrete takes part of load

That the steel and concrete form a composite structure or beam is stressed in the report. Thus, the upper flange stresses averaged only 30 percent of those in the lower flange, indicating that the concrete deck was acting as part of the upper flange. Comparison of the recorded stresses in the two flanges showed that the neutral axis of the combined steel and concrete section is not at mid-height of the girders, but is quite close to the upper flange (calculated as about 25.15 in. and recorded as 28.2 in. below that flange).

In the diagram, Fig. 2, the location of the neutral axis is determined by drawing to scale the average upper and lower flange stresses for slow speed and high speed. In calculating the location of the neutral axis, the modulus of elasticity of steel was taken as ten times that of the concrete, and the entire deck, including curbs, was assumed to be acting integrally with the girders. The drawing shows the close agreement between the calculated and recorded locations of the axis. The report states that: "For the deck to act as part of the top flange, the concrete and steel must develop a bond stress of 64 lb. per sq. in. for the heaviest locomotives, which is not excessive. In addition to this bond, the rivet heads are capable of developing mechanical anchorages."

Conclusions from the test

Conclusions in the report, based on test results, may be summarized as follows: (1) The concrete was well bonded to the steel, and the entire section acted as a composite beam. (2) The recorded static stresses were only 75 percent of the calculated stresses, based upon the concentrated wheel loads and the steel section only; but the recorded stresses were 91 percent of stresses calculated on the basis of the composite structure, and about 95 percent if the rail is assumed to act as a continuous beam on an elastic support. (3) The track effect stresses for the electric locomotives were somewhat greater than those provided in A.R.E.A. rating rules, except at high speeds. (4) Combined track and hammer-blow effects were appreciably lower than hammer-blow effects provided in the above rules. (5) Increase in stress due to speed was very small, and seemed to bear no relation to speed. Larger speed effects have been found in other spans.

Impact stresses lower

(6) Stresses due to roll were appreciably lower than those in the A.R.E.A. specifications or rating rules. (7) Total impact percentages, based upon recorded static live load stresses, were also lower than those of the A.R.E.A. (8) With computations based upon the steel section only, the recorded maximum stresses were appreciably lower than the calculated live load plus impact stresses, using either the A.R.E.A. design or rating rules on impact; these recorded stresses were generally lower than the calculated static live load stress. (9) The amount of damping in this bridge was greater than in an open-deck bridge of equal span, due to the cushioning effect of the ballast and the higher frequency of the bridge acting as a composite beam. (10) It can be assumed that if the bond between the concrete and steel is sufficient to make the two parts act together, the static live load stresses will be considerably smaller than in a similar steel span with open deck; also, that the amount of impact will be materially reduced, due to the increased damping.

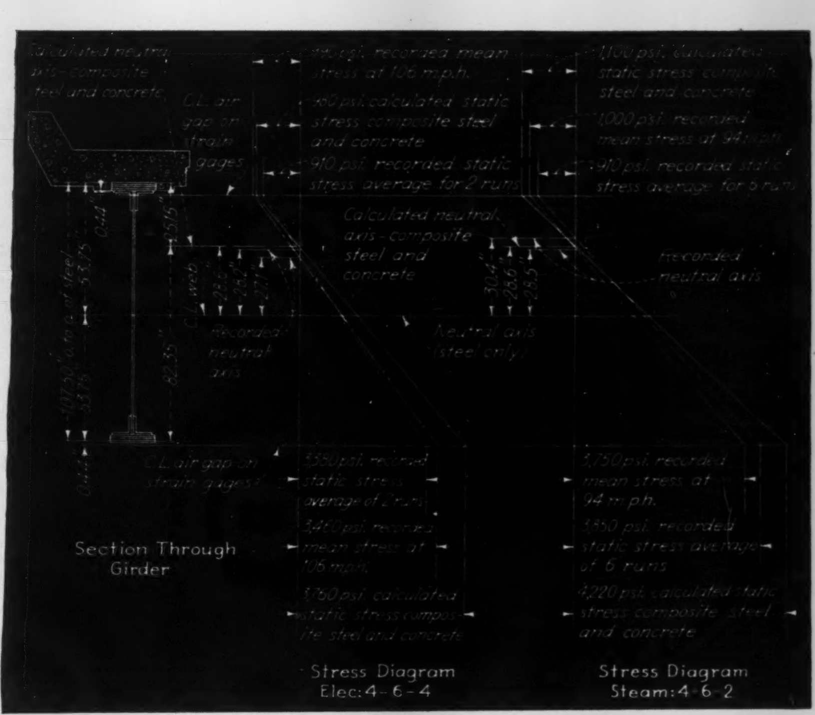

Calculated neutral axis–composite steel and concrete
C.L. air gap on strain gages
psi. recorded mean stress at 106 m.p.h.
960 psi. calculated static stress composite steel and concrete
910 psi. recorded static stress average for 2 runs
1,100 psi. calculated static stress composite steel and concrete
1,000 psi. recorded mean stress at 94 m.p.h.
910 psi. recorded static stress average for 6 runs
Calculated neutral axis - composite steel and concrete
Recorded neutral axis
0.44"
25.15"
107.50" area of steel
53.75
53.75
82.35"
C.L. web
28.6"
26.2"
27.1"
30.4"
28.6"
28.5"
Recorded neutral axis
Neutral axis (steel only)
0.44
C.L. air gap on strain gages
3,580 psi. recorded static stress average of 2 runs
3,460 psi. recorded mean stress at 106 m.p.h.
3,760 psi. calculated static stress composite steel and concrete
3,750 psi. recorded mean stress at 94 m.p.h.
3,850 psi. recorded static stress average of 6 runs
4,220 psi. calculated static stress composite steel and concrete
Section Through Girder
Stress Diagram Elec: 4-6-4
Stress Diagram Steam: 4-6-2

Fig. 2. Comparisons between the calculated and recorded locations of the neutral axes of the girders indicate that the steel girders and concrete deck function as composite beams, depending upon the development of the proper amount of bond betwen steel and concrete.

City Upheld By Courts In Refusal To Handle Industrial Wastes

A municipality may refuse to accept for treatment at its sewage disposal plant industrial wastes that interfere with the successful operation of the plant, according to a decision handed down on September 27 by a state circuit court in Madison, Wisconsin, and reported by James G. Wallace, city manager of Kenosha, Wis., in the November number of *Public Management.*

The facts in the case were: The city of Kenosha upon order by the state board of health built a sewage disposal plant which began operation in 1940. It was soon discovered that bacterial action in the treatment of the sewage was practically eliminated by the large amount of copper sulphate, grease, oil, and other substances contained in wastes deposited in the sewerage system by two concerns engaged in the manufacture of brass and copper products.

As a temporary expedient the city by-passed these industrial wastes and a large percentage of the raw sewage of the city went into Lake Michigan without treatment. Within a short time the water and the city's beaches were covered with a greasy scum which led to many complaints.

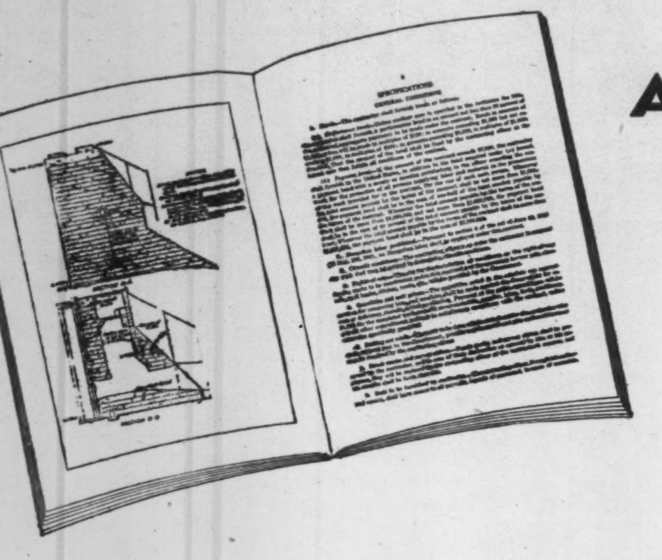
City officials finally took up the matter with the state board of health, which ordered the two companies to treat their waste materials in such a manner as to enable the city to treat all domestic sewage at the municipal disposal plant. The private companies demurred and the attorney-general of the state affirmed the order of the state health board.

The companies then took the case to the circuit court at Madison which has sustained the order of the state board and ordered the companies to eliminate the nuisance caused by contaminating and ruining the city's beaches and by discharging into the sewerage system industrial wastes that cannot reasonably be handled through the disposal plant.

Many other cities are faced with the same problem—waterfront nuisances created by disposal of industrial wastes containing grease and oils and nuisances causing serious difficulties in the operation of the sewage disposal plant. Some industries believe, states Mr. Wallace, that a municipality is obligated to provide anything that is demanded, or the industry may threaten to move out of town unless its request is granted. This court decision in Wisconsin should strengthen the position of cities in their determination to avoid providing special privileges. It is entirely possible for industrial concerns to prepare their wastes for proper handling by the sewage disposal plant, concludes Mr. Wallace.

Ambiguous Words In Specifications

Rolf T. Retz
National Advisory Committee for Aeronautics
Langley Field, Va.



***Contents in Brief*—Phrases commonly used in specifications frequently are without significance or are a source of confusion to bidders, resulting in higher costs to the owners. Indiscriminate use of such phrases as "to the satisfaction of the engineer" makes the contract indefinite, and occasionally is unfair to the contractor. Elimination of ambiguous phrases will facilitate accurate bidding and will remove sources of friction between the contractor and engineer, to the benefit of all concerned.**

THE PHRASE "in the opinion of the engineer" is much overworked and misused in engineering specifications. Although it has a legitimate place, it is more often superfluous than necessary. Its use also may be highly undesirable, because in most cases it causes specifications to be ambiguous and in some cases unfair. This in turn raises the bid price and is a source of confusion and friction between the engineer and contractor.

There are other similar phrases that are equally open to criticism. Among them are: "To the satisfaction of the engineer;" "as directed by the engineer;" "when required by the engineer;" and "at the discretion of the engineer."

Unfair wording

Indiscriminate use of any one of these phrases can result in a contrast that is unfair to the contractor. Typical examples from actual specifications are as follows:

> Each layer of embankment shall be compacted *to the satisfaction of the engineer.*
>
> Each day's spread shall be rerolled on the following day and thereafter *as directed by the engineer.*
>
> The unit heaters shall be controlled by themostats, located *where indicated by the engineer.*
>
> *Where directed by the engineer,* the contractor shall provide a safety switch of the type and size indicated on the drawings.
>
> Trenches shall be excavated to the depth specified on the drawings, or *as directed by the engineer.*

All of these are unfair because they are so worded that the requirement becomes indefinite in magnitude and scope. A bidder quoting on these specifications would not know (a) what degree of compaction is required; (b) how much rerolling is required; (c) how many thermostats are required; (d) how many safety switches are required; or (e) how deep the trench must be excavated.

This prevents the bidder from making an intelligent bid and causes him to gamble on what the engineer may require him to do. It, therefore, invariably results in higher bid prices than necessary, and the owner will then have to pay for the most expensive performance, regardless of whether or not the work is performed in such expensive manner. In addition, an engineer who is not reasonable, may cause considerable friction by insisting upon carrying out the work according to the strict and unfair literal interpretation of the specifications. While the contractor probably could get his rights by going to court, he, naturally, hesitates to do so in minor matters, but the friction and ill feeling created by such unfair wording will still be present.

Ambiguous words

> The thermostats shall be standard products of a single reputable make, *and shall be approved by the engineer.*
>
> The contractor shall furnish weather stripping of manufacturer's standard type, *meeting the approval of the engineer.*

These statements are ambiguous and misleading because the bidder will not know whether or not the engineer will approve any thermostat or weather stripping which meets the requirement of being "a standard product." The italicized words would seem to imply that the engineer may have the right to be arbitrary and reject any product which he does not like, even if the product is a standard product.

It is, of course, true that the engineer should be able to get the kind of materials and equipment and the degree of workmanship he desires, and the contractor is obligated to furnish this, provided the specifications call for it in clear, concise language. However, if the specifications are indefinite or vague, either specifying nothing, or specifying "a standard product," the engineer can then only require the contractor to furnish materials or workmanship which is ordinarily found in work of nature similar to that under contract.

It is true that the engineer is to be the judge of whether such work is "standard," but, in the exercise of duties, the engineer must be onable and no matter what the ifications state, he cannot be unonable. Therefore the phrase "aped by the engineer," does not the engineer any special authorwhich he did not already have. has already the authority to reanything not meeting the requirets of the specifications, but he has authority arbitrarily to reject ething which already meets the ifications, and cannot be given such authority by any special ding.

Superfluous words

> he installation of pump and otor assembly *shall be approved y the engineer.*

his sentence does not add anyg to the clarity of the requiret. It does not tell the contractor to install the pumping units, and oes not give the engineer any new er. If the engineer who wrote specification had known what he ted, he would have been specific clear, and would have given inctions on how to install the pump. ead, he preferred to keep the bidguessing as to what the engineer ht require the contractor to do.

n such cases, it is a considerable rovement to state that the work ll be in accordance with good ineering practice." Even though h a statement is not very explicit, s better than the example quoted.

> he work shall include all items ncidental to the proper execution f the work, as indicated on the rawing, specified herein, *or orered in writing by the engineer.*

he words in italics have no place a proper specification because anyg ordered in writing by the engir is *not* included in the specificans. Exactly because it is *not* in the cifications is the very reason why as to be ordered in writing, so that can become a change order or a pplemental agreement. Anything eady in the specifications need not ordered in writing, in fact it need even be ordered, because it is aldy a part of the work which the ntractor has agreed to do. Anyng outside of this agreement is *not* rk included.

More excess baggage

> ompleted linoleum surfaces shall e cleaned *and left in a condition atisfactory to the contracting ofcer.*

> Clear window glass shall be used throughout, except as indicated otherwise on the drawings, as specified below, *or as required by the contracting officer.*

> Surfaces shall be properly cleaned, thoroughly dry and *in condition acceptable to the contracting officer* before the work is started.

> Asphalt tile shall be of the sizes indicated on the drawings *or as approved by the contracting officer.*

The italicized phrases in the above clauses do not add anything to the clarity of the requirement, and should, therefore, either be eliminated or rewritten to state exactly what will be acceptable, approved, satisfactory, or required.

Permissible uses

There are times when somewhat similar qualifying phrases clarify the specifications or facilitate the work. Take for example:

> All work shall be to the dimensions and typical cross sections shown on the plans and to the lines and grades shown on the plans *or established by the engineer.*

The words in italics are permissible in unit price contracts because they do not imply any change in the quantity of work done other than that covered by a reasonable variation of the approximate quantities given in the bid schedule. Furthermore, it gives the engineer the right to establish lines and grades not definitely established at the time of preparing plans, and to change lines and grades to accomplish savings, where possible.

> The work includes removal and disposal of all spoil material in the disposal areas indicated on the drawings *or designated by the engineer.*

The italicized phrase is permissible only when such "designated" disposal work will not cause an increase in the cost of the work as conceivable to the bidder at time of bidding.

> Local available species of wood, other than those listed may be used subject to the *approval of the engineer* provided such species possess characteristics equal to those set forth in the applicable grading rules listed.

> The color shall be *as selected by the engineer* from the manufacturer's standard color range.

The italicized words in the first quotation are permissible as they in-

GUIDES TO CLEAR SPECIFICATION WRITING

(a) Be definite, clear, concise, and fair.

(b) State acceptable workmanship or performance requirements in clear engineering terms, whenever possible.

(c) If this is not possible, it may be permissible to state that the work shall be in accordance with good practice.

(d) Do not insert such phrases as "as approved by the engineer," "in the opinion of the engineer," "as directed by the engineer," and "at the direction of the engineer," ***in place of*** **definite workmanship requirements.**

(e) Such phrases may be inserted ***in addition*** **to definite workmanship requirements, and where alternate construction is acceptable.**

(f) Do not insert such phrases as "as specified by the engineer" and "as ordered by the engineer," because they are superfluous and do not give the engineer any additional authority that he does not already have.

(g) Use such phrases as "as established by the engineer" and "as designated by the engineer," only in unit price contracts, and even then, use it sparingly, so as not to imply that the engineer is given any unreasonable authority.

(h) Remember that the engineer must be a reasonable person and that in the exercise of his duties he cannot ***add*** **requirements to the work which were not clearly stated at the time of bidding.**

(i) The specifications must therefore, be so worded that they do not leave the ***bidder*** **in doubt as to what he as contractor would be required to do.**

(j) By all means, remember that vagueness of language will cause higher bid prices and friction in contract relations.

dicate that alternate materials and workmanship, if as good as those specified, may be substituted with the approval of the engineer. In the paint specifications, the wording indicates that the choice of color is left to the engineer, provided the cost does not vary.

Needed Definitions

Somewhere in the specifications there should be a paragraph which defines the words, *directed, required, permitted, ordered, designated, prescribed,* or words of like import, and the words, *approved, satisfactory, acceptable, suitable,* as pertaining to the engineer.

It is the engineer's duty to pass upon the work. But this duty can be carried out much easier and with much less friction, if "suitable," "satisfactory," and "approved" workmanship is clearly defined in the specifications. I would, therefore, seem advisable to use the phrase "in the opinion of the engineer', only when the workmanship that the engineer will approve has been defined.

Even if the engineer is willing to accept "almost anything," it shou be remembered that vagueness language is not acceptable as a mea of saying that "almost anything" w be accepted. Specifications must definite and concise, even if a low de gree of workmanship is acceptabl Specifications should in such cas state the minimum requirement whic the engineer is willing to accept i clear, definable engineering term and then state that the work will rejected if, in the opinion of the e gineer, such work does not me these requirements.

Hydro Project in Uruguay Will Double Nation's Power Supply

A HYDRO-ELECTRIC PROJECT that will more than double Uruguay's power supply is expected to go into operation in 1945, following installation of a 30,400 kw. waterwheel generator, to be supplied by the International General Electric Co. This generating unit is one of four that will deliver a total of 121,600 kw.—approximately the same output as that of an average-size project of the Tennessee Valley Authority.

The dam for the project is located on the Black River, which crosses the entire country from northeast to southwest. In supplementing Uruguay's present power capacity estimated at 110,000 kw., most of which is centered in Montevideo, this added output is expected to develop expansion of industry elsewhere in the nation and electrification of rural areas throughout the 26,000 sq. mi.—36 per cent of the nation—drained by the 530-mi. Black River.

The dam will also serve three other purposes, flood control, irrigation for farm lands, and navigation for delivering farm and ranch products to market and manufactured goods to sparsely populated districts. Few dams offer all four services; Boulder, for example, does not provide navigation, while the TVA dams do not provide irrigation.

The national government of Uruguay, which enjoys a monopoly of power generation and distribution, long has sponsored studies of hydro-electric possibilities. The Black River, the studies showed, had a total fall of 425 ft., with little water from October to April, hence the construction of several dams did not seem feasible.

When contracts for the project were awarded in 1934 most of them went to a group of German manufacturers and the dam proper was nearly completed at the site chosen—Rincon del Bonete, in the department of Tacuarembo—when the war brought work to a standstill. In January, 1942, following the Rio de Janeiro Pan-American conference, Uruguay broke off relations with the Axis nations and in July of the same year the United States Export-Import bank loaned the government $12,000,000 to permit completion of the work.

The General Electric Co. was awarded a contract for the first generator, which is now in the design stage. From the bottom of the shaft to the highest part of the machine it will stand 25 ft. high and have an overall diameter of 39 ft., corresponding in size to generators provided for the Kentucky Dam of the TVA.

The Black River Dam is 130 ft. high and has a length of 3,850 ft., roughly equivalent to an average-size TVA dam. It will create a storage level of about nine million acre-feet at the normal level and a flood storage of three million acre-feet for a total of 12 million acre-feet. The lake created by the dam will extend upstream for a length of 87 mi. with a maximum width of 18 mi.

Uruguay's power resources

Uruguay's only large power stations are two steam plants in Montevideo; the rest of the country, which supports two-thirds of the population of two and one-half million persons, being supplied chiefly by isolate plants operated by oil, which mu be imported. Thus, with war cuttin off imports, Uruguay was confronte with power shortages which threate to become as serious as those i Argentina, where one ton of corn i added to three tons of coal burned i steam power stations, because of coa shortages.

In addition to relieving power demands, the Black River generatin plant is expected eventually to become a manufacturing center.

Improved navigation provided b the dam is expected to facilitate th marketing of products that must b transported inland.

Postwar development

Another hydro-electric developmen with a potential installed capacity o 500,000 kw. is being studied as postwar possibility. Located at th falls of Salto Grande on the Urugua River, of which the Black is a tributary, such a project would have to b carried out jointly by Uruguay an Argentina since the Uruguay Rive forms a boundary of the two nations

The hydro-electric power potentia of Latin America, three times that o the United States, is expected t prove a basic factor in the postwa industrial expansion of the republics to the south. Whereas such projects as TVA, with an eventual capacity o 2,382,000 kw., and Boulder Dam which will reach 1,322,300 kw., account for the development of 19 of th 25-million United States potentia only two millions of the Latin American potential of 80 million kilowatts have been developed.

Brazil, which ranks fourth to Russia, the U. S., and Canada in potential hydro-electric power, has a potential output of 19-million kw.

Materials Testing in Venezuela

By Eugene V. Barrett
Chief of the Materials Testing Laboratory, Ministry of Public Works,
Caracas, Venezuela

itors Note—*Keenly aware of the need for complete and comparative ormation on the materials used in construction, the Ministry of Public orks of Venezuela has provided up-to-the-minute facilities for laboratory field testing. The author of the article, a 1928 graduate of Columbia versity, served for five years as an engineer with the civil engineering ing laboratory of the university and later was assistant to the chief of New York City WPA division of materials and inspection. He has been enezuela since 1936.*

EZUELA, northernmost of the th American republics, is making id progress in applying modern ctice to the solution of engineering blems and the development of the ntry. One evidence of this is to found in the laboratory facilities provided for the testing of materials used by the National Ministry of Public Works, which is now engaged in a program of improvements valued at more than $118,000,000. On occasion, the facilities of the laboratory are made available to private industry.

The idea for a centralized laboratory dates back to 1936 when Dr. Francisco J. Sucre, at that time director of the Sala Tecnica of the Ministry of Public Works, created a materials testing division and designated Dr. Luis A. Urbaneja, professor of materials of construction in the University of Caracas, as head of the division. Prior to this the ministry did not have any facilities for testing the materials it used.

Receiving the enthusiastic support of Dr. Tomas Pacanins, then minister of public works, funds were made available, and before the year ended the services of the writer were con-

. 1. Testing equipment from the United States occupies a prominent place in one of the laboratories of the Venezuelan istry of Public Works. Here can be seen the 66,000-lb. universal testing machine, soil consolidation and shear appatus, and impact and wear-testing equipment.

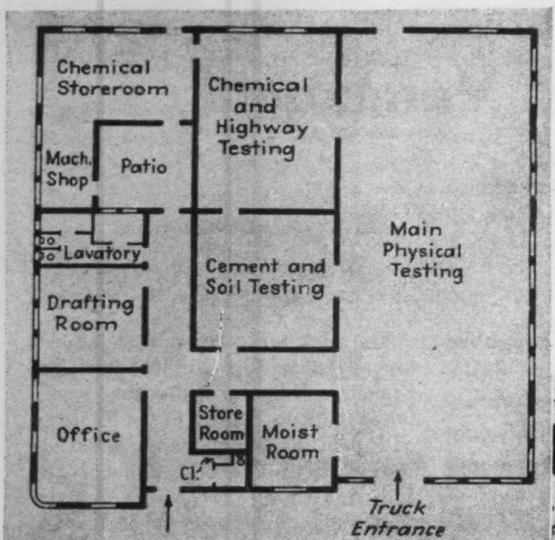


Fig. 2. General layout of the laboratory building, the outside dimensions of which are about 100 by 100. At the right is a portion of the building exterior, whose modernistic concrete frame and glass block facade combine beauty with function.

tracted. It has been his privilege to plan the layout of the laboratory, recommend the equipment and train the personnel to operate it.

The laboratory was built and equipped for physical testing of the principal materials in 1937. Since it was expected that it would be necessary in the future to add to this building, the designs and location provided for expansion in two directions. In 1937, during the administration of Minister Dr. Enrique Aguerrevere, additions were made to the original building for the housing of chemical, highway, soil and other physical testing equipment.

The present minister of public works, Dr. Manuel Silveira, has authorized additions to both the personnel and equipment with the result that the activities of the laboratory are rapidly expanding. Since its inception, the laboratory has been a part of the ministry's division of ways of communication, the director of which is Dr. Sucre. (Editor's note: No stranger to the United States, Dr. Sucre's latest visit to this country was in November, at which time he was making a study of airport construction and facilities.)

At present the laboratory staff consists of eight engineers and two technicians. It is of interest that five of these engineers are Venezuelans who have received engineering degrees in the United States, and one of the others is a graduate engineer from the University in Caracas with two years of graduate study in the United States. These engineers are Pedro N. Diaz, Rensselaer, 1938; Joseph L. Andara, City College of New York, 1937; Leopoldo Turco, University of Michigan, 1933; Joseph A. Baldo, Tri-State College, 1937; Carlos L. Pacanins, Toledo University, 1943; and Eudoro Lopez, graduate study at Columbia University, 1926, and New York University, 1927.

Equipment for testing cement

Present equipment of the laboratory permits complete chemical and physical testing of practically all the materials used by the ministry.

For example, the laboratory tests all of the cement produced in the country as well as all imported cement; to date tests have been performed on more than 60 brands from 15 different countries. Over a period of two and a half prewar years, comparative tests were made of all cements used by the ministry. The tests included complete chemical a alysis, autoclave, fineness, briqu and similar routine tests.

In addition, for each cement s 6x12-in. cylinders were made. All the mixes contained the same weig of cement, sand, coarse aggregate a water. The sand was all of the sa quality and grading, and the coar aggregate was the same quality broken stone, separated into thr sizes, each size weighed out separate for each mix. All of the mixes we of plastic consistency and three cyli ders were tested at seven days a three at 28 days. It is expected th the results of these tests will be avai able for publication in the near futu

Wood and soil testing

The laboratory has tested a consi erable number of the woods native Venezuela, and it is planned to exten this investigation to include all of th woods that occur in sufficient quanti and size as to merit consideration.

The soil testing equipment permi consolidation, shear, liquid and pla tic limit, optimum moisture, h drometer, grain size, permeabili and other tests. A considerable nu ber of soil tests relative to found tion, dam and highway investigatio have been made.

In addition, some research wo has been done and a method deve oped which reduces the time of pa ticle size determination for the min 200 sieve fraction from 24 hours to hour and 20 minutes. This metho also eliminates computations th make the hydrometer method so ted ous.

Considerable work has been don with cutback asphalt stabilization o soils and sands, both relative to ai ports and highways. One cement-soi stabilization job has been complete field-controlled by the laboratory.

In addition to the making of tests the laboratory makes field investiga tions and submits reports and recom mendations. It also prepares specifi cations and, when authorized by th ministry, cooperates with private in dustry.

Venezuela's public works progra

Some idea of the demands that ar made upon the laboratory may be ob tained by a brief outline of the publi works program now under way in Venezuela.

The federal government in 194

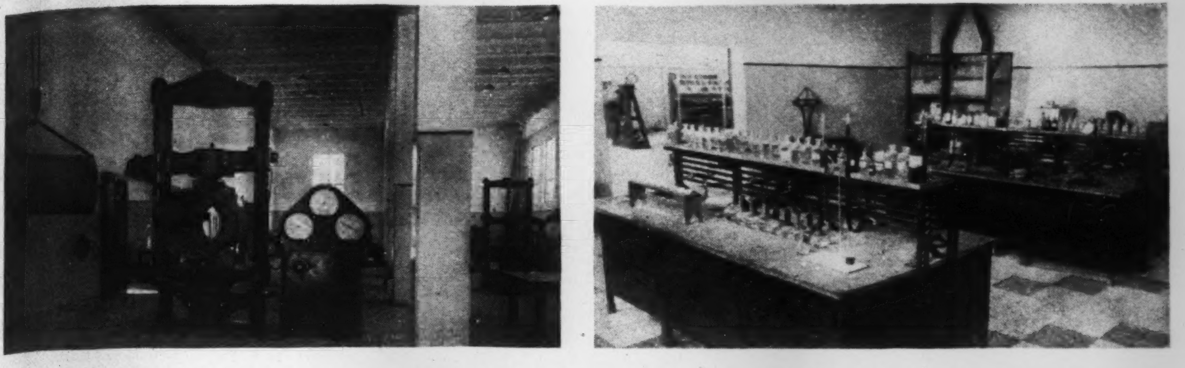


Fig. 3. This 308,000-lb. Universal testing machine is so located with reference to the truck entrance of the building that heavy pieces of material can be lifted directly from the truck to the machine with the aid of an overhead crane. Right: Chemical and asphalt testing laboratory facilities permit the conduct of both routine work and research projects.

received approval of President Isaias Medina A. to undertake a five year program of federal construction, totaling $118,550,000. This program, which designates the specific works to be constructed and establishes the probable date for the start of work on each project, includes the following:

Highway construction	$24,500,000
Ports and navigation improvements	6,050,000
Airport development	4,900,000
Public buildings and schools	27,800,000
Water and sewerage	42,900,000
Irrigation works	12,400,000

In spite of the war and scarcity of equipment and materials, a considerable number of these projects are either being constructed or about to be built. The laboratory is playing an increasingly important part in this program.

Transportation Arteries to the Coast Improved by South American Republics

Two important projects involving heavy construction are being carried out against great topographical obstacles in Ecuador and Colombia. One is a railway extension and the other a highway project. Both jobs are designed to improve transportation facilities from the interior to the coast of these South American Republics.

One of the most difficult railroad construction jobs now underway in South America is being carried out through the high Andes of Ecuador. Two feeder lines are being extended to tap the northern and southern interior of the republic.

The feeder lines connect with the Guayaquil and Quito Railway, the nation's main railroad line, between Guayaquil, the chief seaport, and Quito, whose altitude is 9,500 ft.

By the end of 1943, it is expected that the government-owned Sibambe-Cuenca Railway, with the aid of a $400,000 credit from the U. S. Export-Import Bank, will have extended its line from Tambo to Azogues, a distance of 28 miles. Construction on the extension has been finished as far as Biblian, less than five miles from Azogues.

Eventually Ecuador hopes to extend this feeder line to Cuenca, the largest city in Southern Ecuador, with a population of 50,000. Meanwhile, Cuenca is connected with the railhead of Azogues by a paved segment of the Pan American Highway.

The northern feeder line, on which construction is proceeding, is the government - owned Quito - Esmeraldas Railway. Here construction is slowed by difficulty of obtaining equipment. A roadbed has been laid a short distance beyond Salinas on a projected route to the northern port of San Lorenzo, which has no rail or highway connection. The projected rail line to San Lorenzo will cross a big tropical forest area.

An illustration of what the engineers and contractors are up against is portrayed in the completed route of the southern feeder line. Leaving the Alausi River Gorge at Sibambe, where the elevation is 5,925 ft. the railroad winds over mountain ranges to attain a maximum altitude of 10,646 ft., a net climb of 4,721 ft. There are long stretches of gradients ranging from 3 to 4 percent. The maximum grade is 5.5 percent.

Seven common carrier railways operating in Ecuador have a total route length of 692 miles. Of this total, 374 miles represent five state-owned lines and the remaining are privately-operated mileage.

The Guayaquil and Quito Railway is privately-owned but government-controlled. Its 281-mile route runs the topographical gamut from the hot lowlands of the Guayas delta to plateaus among snow covered volcanic peaks.

Andean road blasted through rock

A stretch of five and one-half miles over the Western Cordillera on the 83-mile national highway being constructed between Cali and the seaport of Buenaventura is the toughest road construction job now going on in Colombia—if not in South America. The road must be blasted through solid rock nearly all the way. The gap is about 57 miles to the west of Cali, and is one of four on which Colombia is centering her road-building efforts.

Of the three other gaps, two are on the highway between Medellin and Bogota, the capital. They are between Sonson and La Dorado and between Honda and Guaduas.

The fourth gap where road construction is going on is on the 76-mile route between Pavarandicito and Turbo, on the Gulf of Darien. Pavarandicito is on the Pan American Highway route between Medellin and Panama. Consequently, completion of this road to Turbo will provide a link with the Pan American Highway from the Caribbean Ocean long before a motor road through Southern Panama is finished.

Erecting Box Girders of 220-Ft. Span To Carry Doors of Navy Blimp Docks

***Contents in Brief**—Steel-and-timber girders across the top of doorways of the Navy's big timber blimp docks guide the doors and take wind load. Doubled, diagonal plank sheathing stiffens all four sides; camber only about 1½ in. Method of erection at each location left to contractor. At Moffett Field one of these girders was swung in 6 days.*

THE LARGE TIMBER DOCKS for lighter-than-air craft being built by the Navy in a number of locations throughout the country, involve unusual construction in the framing for the doors at either end, which are designed for wind loads of 20 lb. per sq.ft. on a clear opening of 120 x220 ft. The door frame consists of a pair of concrete columns or towers on either side, supporting a steel-and-timber box girder or beam with a clear span of 220 ft. across the top. A description of construction of one of the hangars and references to previously published articles, appeared in *ENR*, Dec. 2, 1943, p. 826.

Each pair of concrete towers occupies a 14x40-ft. ground area, tapering to 12x40 ft. at the top. The legs are hollow, with 8-in. horizontal diaphragms at 18-ft. intervals, and at the top a 12-in. concrete cap. The inner faces of each pair of legs are 12 ft. apart, thus forming the "door pockets" in which the door leaves stand while the doors are open.

The doors themselves consist of six vertical leaves, each 37 ft. wide, extending the full 120-ft. height of the opening and operating on trucks, each driven by a 7½-hp. motor. The entire weight of the leaves is thus carried on the track at the bottom. The wind load on the 120x220-ft. door is considered as being divided equally between the girder across the top and the rails of the track at the bottom.

The girder is a box structure 22x 22 ft. in section, made up of transverse timber frames at 7-ft. intervals and doubled diagonal plank sheathing on all four sides, bolted to steel angles or shaped metal plates at the four corners. For localities where earthquakes occur the girder is designed to be resistant to seismic forces up to a horizontal loading of 0.1 g. Where extremely high winds are frequent, they were considered in design. However, wind and earthquake were not considered to act simultaneously.

The long span and heavy horizontal load on such a girder, built largely of timber, plus the fact that any considerable settlement would interfere with door operation, focus interest on this feature of the dock project as a whole. With different methods of construction being used by different contractors in different parts of the country and as experience has accumulated, improved construction methods have been developed that have considerably simplified erection procedure. Some

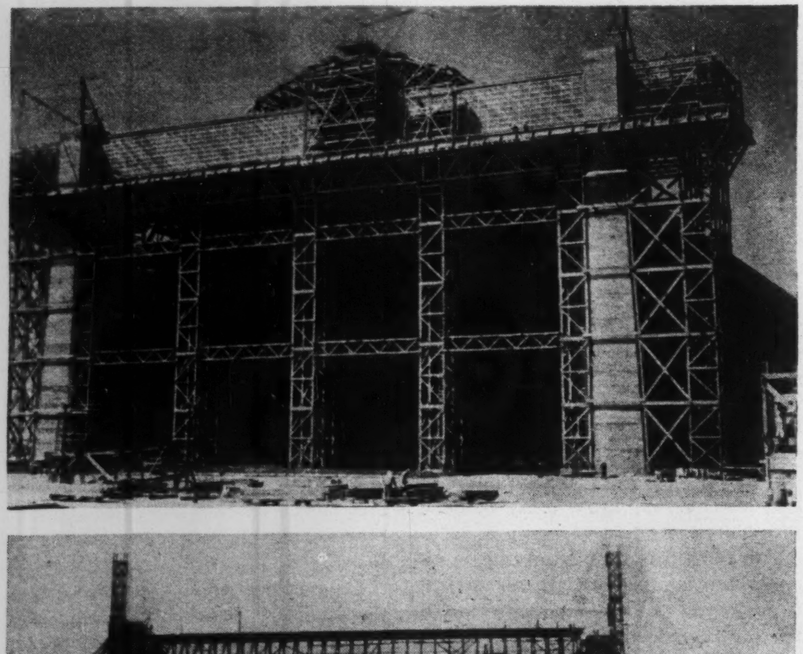


Fig. 1. Examples of two types of falsework used where the girder that carries the doors was assembled in place.

contractors have preferred to construct the girder on the ground and lift it bodily to place. Others have chosen to erect falsework designed to carry the weight of the entire girder, sending up individual pieces for assembly in place.

On the contract for two of these docks at Moffett Field, the plan of erection was assembly in place on falsework built up in the form of towers made of the simple, sturdy units shown in one of the pictures in Fig. 1. The units or sections were 10x10 ft. in plan, each 22 ft. high, made with an 8x8-in. timber at each corner and ample diagonal bracing put together with ring connectors. Footings for each of these towers were made by putting sand in a shallow excavation, planking it over with 3-in. timbers and laying thereon a platform of 12x14-in. sills. The tower footings were separated from these sills by pairs of long-taper wedges. To compensate for any settlement the footings could be wedged up. The girders each contain about 142,000 b.ft. of timber and weigh, when the timber is fresh from its fire-resistant treatment, about $1\frac{1}{2}$ tons per lineal foot (total about 330 tons per girder).

Big gantry used

Assembly of the girders at Moffett Field was speeded by an all-purpose gantry that straddled the girder, with enough clear space on sides and top so that movement of the gantry would not interfere with work under way. A derrick surmounting the gantry hoisted all materials from ground level and set them in place; three platforms on either side provided convenient working stages for the crews.

An item in which the contractors' practices in different locations has varied widely is the method of fastening the diagonal sheathing to the steel at the four corners of the beam. On one contract, instead of the usual angle or shaped steel member at the corner, two flat steel plates were used, put on in separate pieces to facilitate assembly, and later welded together along the contact edge. The ultimate effect was thus the same as if an angle had been used, and by making the weld after the final set of the girder had taken place, necessity for reaming each bolt hole was avoided.

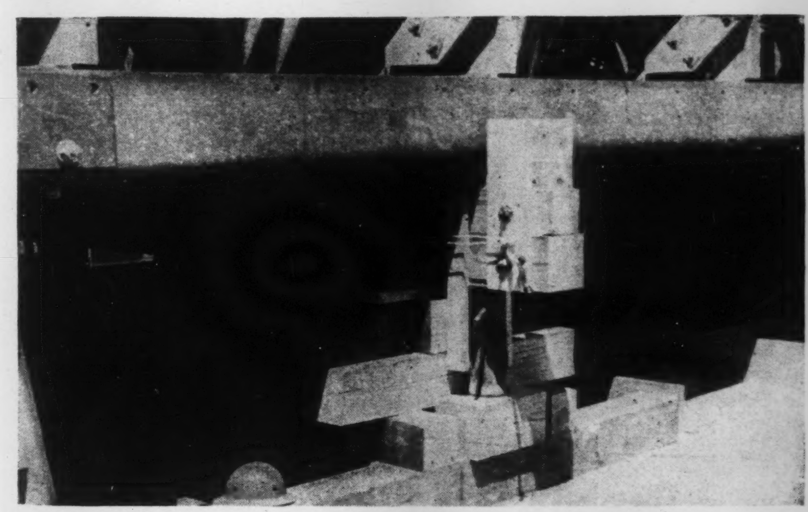


Fig. 2. Adjustments for camber were made with screw jacks placed as here shown, at 15-ft. intervals.

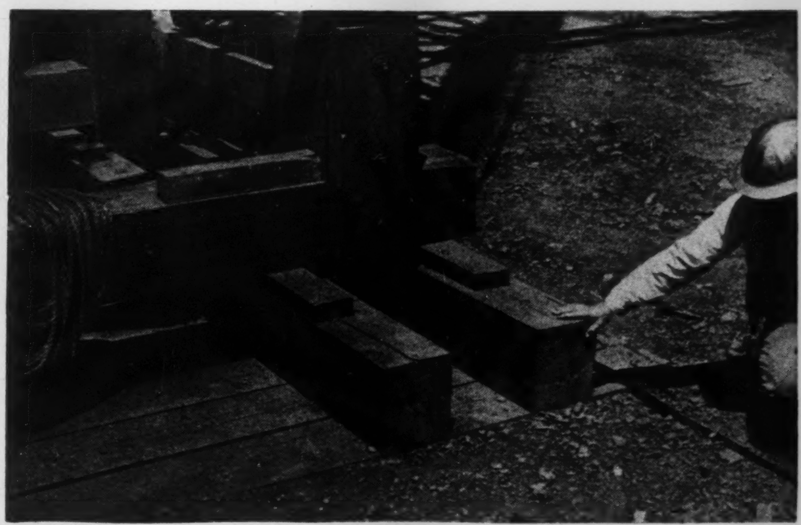


Fig. 3. Falsework footings resting on 10 x 12-in. timbers. Note long-taper wedges designed for use in the event of settlement.

At Moffett Field, typical of the method where holes in the $\frac{1}{2}$-in. shaped steel plate are reamed, the girders were assembled on the falsework and completed in all respects except for the bolts at the base of the sides. The bolt holes in the shaped steel member were made at the steel fabricating plant in the calculated locations, but were smaller in diameter, by $\frac{1}{16}$ in., than the bolt diameter. When the girder, temporarily resting on supports that had been carefully set for the proper camber, had all members in place and was ready to be finally bolted up, these holes were reamed to exact size. To minimize settlement the diameter of the finished hole was only $\frac{1}{64}$ in. larger than the bolt.

After considerable discussion of camber, these box girders were assembled on their falsework with the center point 3 in. above a horizontal line through the supports. This was in the expectation that one-half this amount would be taken up by settlement when the falsework was removed and that a camber of about $1\frac{1}{2}$ in. would remain in the completed structure. In several girders on different contracts, which had been swung clear as this was written, it is reported that the camber is very close to the expected $1\frac{1}{2}$ in.

The door sections, at their tops, rest against and transmit wind load to guides that project 10 in. below the girder bottom. In some docks, timber ribs have been used and in others the ribs are of steel.

To permit of necessary bolt tightening after full shrinkage of the timber has occurred, bolts are put in with the head on the outside, thus making the nut accessible from inside the girder. After assembly has been completed and before falsework is removed, the bolt head on the outside of the girder is spot-welded to the metal to prevent turning when the nut is tightened.

On the Moffett Field contract the third girder (out of a total of four) was assembled complete and swung in six days. After falsework supports had been removed the center was found to have come down about 1⅜ in. below the level at which it had been put together.

The work at Moffett Field was carried out for the Bureau of Yards and Docks under contract held by Earl W. Heple & J. H. Pomeroy & Co., Inc. Personnel listings both for the Navy and the contractors were published in the previous article on this project to which page reference is given in the foregoing.

Rapidly Changing Trends In Forest Products Uses

Recent trends and probable future developments in the use of forest products were discussed in a paper presented at the October meeting of the Seattle Section, American Society of Civil Engineers, by C. J. Hogue, West Coast Lumbermen's Assn. The following has been abstracted from his paper.

Wood has been used largely by rule of thumb methods based on very simple test data. Until quite recently it was the custom to determine the working stresses for some new wood species by testing a number of beams and dividing the breaking strength by 4; or, testing a number of small clear pieces and dividing the breaking strengths by 6. This was based on the observation that by reason of knots and other factors affecting strength, timber in beam sizes broke at two-thirds or more of the stress that could be put on smaller pieces.

Similarly, column values were based on tests plotted so that a straight line could be drawn from the bending strength through the test points to determine the ratio of length to strength. Compression strength was known to be about three-fourths the bending strength so this value was used until it intersected the inclined line and then that line was followed.

In short, there was comparatively little finesse of engineering and very little technical study until recent years. Incidentally, very little promotion of the use of wood. The competition of other materials has been present for so short a proportion of the life of the timber industry that the need for selling effort has hardly been realized. The lumberman has been slow in this realization because between him and the engineer or architect who makes a design in wood there is usually a contractor, a retail dealer, a lumber salesman and often several wholesalers and commission salesmen.

A rapid change has come about with the advent of timber connectors, rings, shear plates, etc. to supplement bolts and nails as timber fastenings, and glued, laminated construction which has provided greater flexibility, adaptability and architectural appeal. With the larger mills taking up fabrication and large fabrication plants coming into existence, the industry is changing rapidly.

From another angle, wood is on the ascendency in future planning because it is the only replaceable natural resource. When iron, coal and oil are gone it would still be possible to compress wood until it is as strong as iron and to compress it with heat to make coal (which is what nature does) or, to squeeze the coal to make oil, as is now being done. In addition, the intricate carbo-hydrate wood fiber can serve many useful purposes. Cork is being made from the cork fleck in Douglas fir bark. Insulation material and wall board are just the beginnings of the wood fiber byproducts that will be made from wood waste.

Cellulose and lignin, both useful wood products, are the two fundamental ingredients in wood. Cellulose, which makes up about two-thirds of the total, constitutes the structural frame. Lignin, the other third, is a filler material. Cellulose has tensile strength and hardness and, when stiffened and supported, compressive strength as well. Lignin has hardness without much tensile strength but it has a cementing and hardening quality that can be made highly useful.

Tensile strength of wood fibers across the grain is disproportionally low compared to other strength properties because the fibers are not well bonded laterally. Shearing strength is a function of tensile strength across the grain. Plywood overcomes this difficulty by alternating the direction of the grain in successive layers. When these layers are at 45 deg. to the grain the strength is four times greater in shear than shearing strength parallel to the grain.

Many developments not now foreseen will come in the field of glued, laminated assemblies of boards and planks for the flat laminations of beams and arches. The wood fiber itself will be used in paper form for curved shapes and tubular spirals. The development of glued, laminated ship timbers, frames and knees is of present interest.

The substance of commercial wood species ranges from one-fifth to one-third hollow wood fiber and four-fifths to two-thirds air space. When compressed under heat to one-fifth or one-third of its original thickness, the strength per unit of cross-section can be increased to the strength of iron, although the weight is only one-fifth the weight of iron. If impregnated with resin glue and compressed hot, this product remains in the compact form indefinitely. There are prospects for many more products of this sort adapted to use in aircraft, automobiles, freight cars and other structural framing where strength and light weight are required.

Chemical developments also offer a large and relatively unexplored field. For example, there is prospect that sugar, which can be distilled from wood cellulose, will produce 45 to 50 gal. of ethyl alcohol per ton of dry wood. Or, the sugar can be treated with nitrogen and made into proteins for a food product. The lignin products may take the form of plastics, adhesives or even fertilizer and plant food. In short, though future developments are in realm of the unknown, there is certain always to be a market and probably a continually increasing market, for products of the forest.

Computations for Influence Lines Simplified by Semi-Graphical Method

C. J. Posey
Associate Professor of Hydraulics and Structural Engineering,
State University of Iowa, Iowa City

e possibility of special industrial or litary traffic on bridges designed r ordinary loads makes it necessary investigate their capacity un- r heavy and unusual loadings ith simple spans, the problem of cing the loads for maximum esses is not difficult. With continu- s girders, equivalent uniform loads n be used if the concentrations are irly uniform in spacing and magni- de, but if the concentrations are even, the use of quantitative influ- ce lines is necessary.

The method outlined here is based on the well-known Muller-Breslau inciple, which is commonly used help visualize the general shape of influence line. According to that inciple, the load line of the struc- re assumes the shape of the influ- ce line if a small unit deformation the right kind is introduced at the int for which the influence line is sired. If the influence line is to be r shear, a pure shearing deforma- on is introduced; if for moment, an gle change is introduced. The struc- re is restrained at the reaction ints, but is not acted upon by rces at any other location. A full scussion of the principle, and espe- ally of its use in sketching qualita- e influence lines, is given in *Con- uous Frames of Reinforced Con- ete* by Cross & Morgan, published John Wiley & Sons, 1932 edition.

The Muller-Breslau principle has en used to obtain quantitative in- ence lines by making accurate easurements of the deflections of odels to which the desired deforma- ons have been introduced, a method hich is laborious and requires ex- nsive equipment. To adapt the Mul- r-Breslau principle to a rapid com- tational procedure, use may be ade of the principle of super-posi- on. Deflections are assumed to be ade up of two components, namely: (1) Those produced by the deformation introduced, assuming that all of the spans are simple spans, and (2) those resulting from the indeterminate moments caused by the deformation introduced. Deflections of the first type do not differ from influence lines for simple spans, and are zero in all spans except that in which the deformation is introduced.

Since there are no forces acting on the structure except at reaction points, deflections of the second class are due to moments that vary linearly across each span. They can be plotted by means of a simple procedure to be explained later. The indeterminate moments needed for the computation of deflections of this type are most easily determined by moment distribution, but any other standard method may be used.

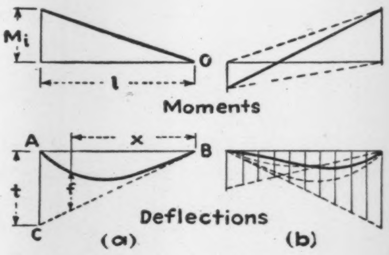


Fig. 1. Deflections in beams due to indeterminate moments.

For moment distribution, the fixed-end moments due to the deflections must first be computed. A small unit shearing deformation at any point in a span l of a beam having constant moment of inertia will cause fixed-end moments at each end equal to

$$M = \pm \frac{6\,EI}{l^2} \qquad (1)$$

A unit rotation at a distance b from the far end of a prismatic fixed-end beam will cause a moment at the near end of

$$M_A = \frac{6\,EI}{l^2}\left(b - \frac{l}{3}\right) \qquad (2)$$

These moments are given a positive sign if they tend to bend the beam so that its elastic curve is concave upward. In Equation (1) the sign is determined by inspection, and that in Equation (2) follows automatically. Thus, if b is smaller than $\frac{l}{3}$, M_A will be negative, indicating that the beam is concave downward. It is necessary for both the sign and magnitude of the fixed-end moments to be correct if the final indeterminate moments are to be accurate. In the illustrative examples to follow, the method of moment distribution is used to obtain the indeterminate moments.

Semi-graphical procedure

Deflections due to the indeterminate moments are computed by a semi-graphical procedure. In each span, the moment diagram can be divided into not more than two triangles, each extending all the way across the span. The deflections due to each are computed separately. Such a moment diagram is shown vertically above the corresponding deflection diagram in Fig. 1a. The first step in plotting the deflection diagram is to determine the intercept, at the end where the moment has its maximum value, of the tangent to the elastic curve at the opposite end. This distance, hereafter called the "tangent intercept," is the distance t in Fig. 1. After it has been obtained, the curve may be quickly plotted by making use of the relationship.

$$\frac{f}{x^3} = \frac{t}{l^3} \qquad (3)$$

This equation can be solved quickly by setting l on the C scale opposite t on the K scale of an ordinary Mannheim slide rule and reading the value of the offset on the K scale opposite

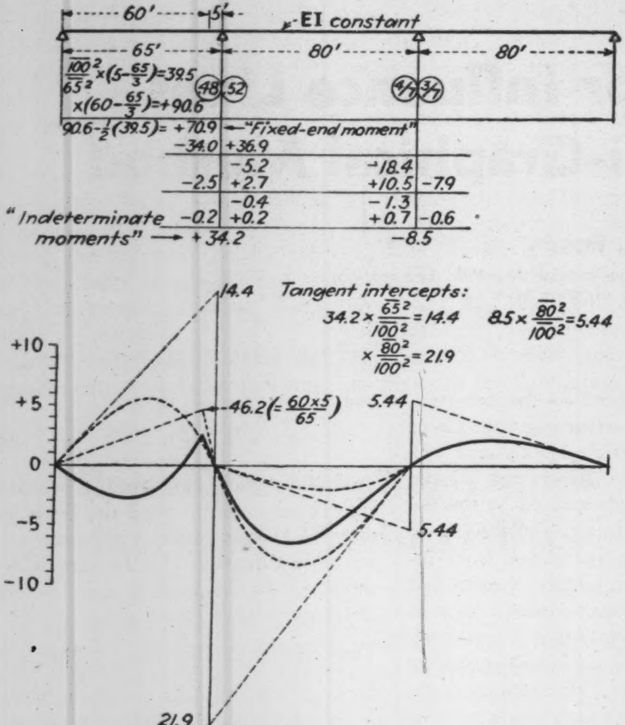


Fig. 2. Influence line for moment at a point in the first span of a three-span continuous girder.

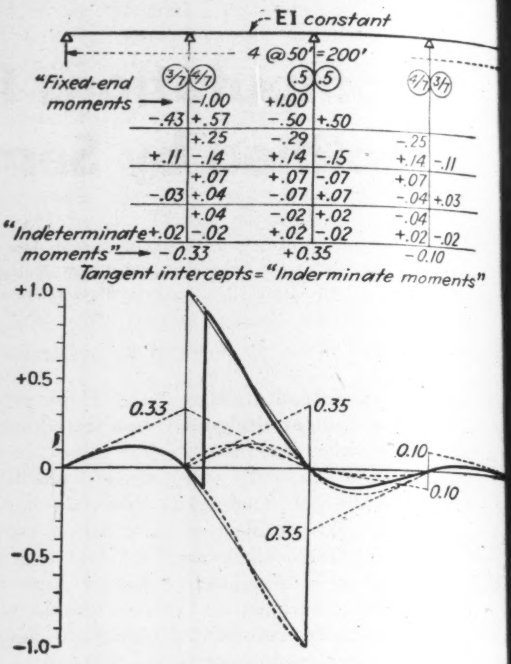


Fig. 3. Influence line for shear in the second span of a four-s girder. All the necessary computations are shown.

the corresponding value of x. If there are indeterminate moments at each end of the span, and the moments are of opposite sign, the deflection curves are plotted on the same side of the axis in order to facilitate graphical subtraction. This work is illustrated in Fig. 1b.

The value of the tangent intercept for a prismatic beam is given by

$$t = \frac{M_A l^2}{6\,EI} \qquad (4)$$

This equation, as those previously listed, can be verified by a number of methods, including double integration, area-moments and column analogy.

For numerical computation, it is best to factor the expressions for the fixed-end moments into two parts, one variable and one constant, and to carry out the moment distribution computations with the variable part only. Thus, if all the spans are of equal length, and EI is constant, the variable part of Equation (2) is merely $b - \frac{l}{3}$, and values of this factor, which from solution of Equation (2) equals $\frac{M_A l^2}{6\,EI}$, are used in place of fixed-end moments. The corresponding "indeterminate" moments subsequently obtained are really values of $\frac{M_A l^2}{6\,EI}$ and are therefore equal to the desired values of the tangent intercept.

If the span lengths vary, EI remaining constant, the procedure is not quite so simple. The variable part of the expression for the fixed-end moments must then include $\frac{1}{l^2}$. To avoid inconveniently small decimals, it is better to introduce $10^2/l^2$ (or $100^2/l^2$ instead. Values of $\frac{10^2}{l^2}\left(b - \frac{l}{3}\right)$ are used in place of fixed-end moments, and the "indeterminate moments" subsequently obtained must be multiplied by $l^2/10^2$ to get the required values of the tangent intercept.

When moment of inertia varies

Similar procedures will serve in case the moment of inertia varies from span to span. If the moment of inertia varies appreciably within the spans, the method becomes very laborious, and extensive modifications must be made. The moment of inertia can be considered to be constant, however, if its variation is due only to change in flange section, and not to change in depth.

All the computations necessary to obtain an influence line for shear any point in the second span o girder having four 50-ft. spans illustrated by Fig. 3. Computati necessary for an influence line moment in a girder having spans 65, 80, and 80 ft. are shown in Fig. In both examples, the simplest m ment distribution procedure is us to obtain the indeterminate momen The abbreviated procedures explain in Chapter IV of the Cross & Morg text would save time in the prepar tion of a complete set of influen lines.

Suspended Spherical Ta

A spherical or globular electricall welded steel storage tank for speci chemical liquids, as recently built England, has around its equator eig brackets link-connected to the tops steel columns. As described briefly "The Engineer," of London, (Ju 30) it is 20 ft. in diameter and wi contain 20 tons of the liquid under working pressure of 15 lb., while is designed for temperatures as low zero Fahrenheit. The novel suspensio system was devised to permit the ste shell to "breathe" under changes o temperature.

From Field and Office

ORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

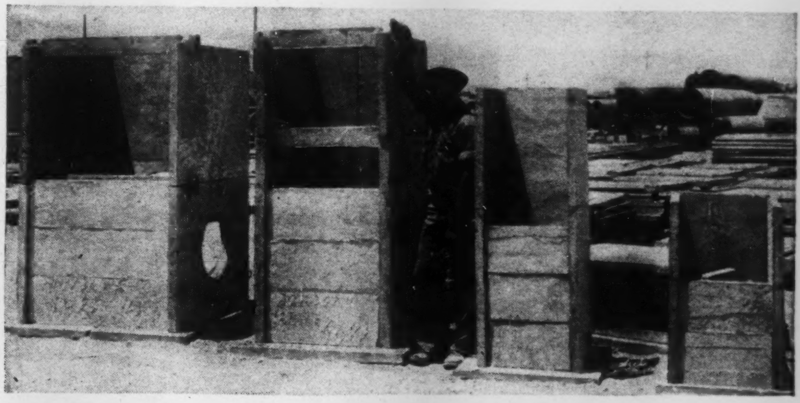
CAMERA MEMORANDUM

orkers of the Frederick Snare Corp., ew York, building an Inter-American ighway bridge over the Goascoran iver, which forms the boundary be-ween El Salvador and Honduras, were nable to obtain a standard concrete ucket. As a result they made on the ob the bucket shown, which tips to the ft. It consists of a 50-gal. drum with e bail made from a piece of rein-orcing steel.

To tip the bucket all that is needed to raise the steel loop shown about e bail to clear the short piece of rod elded to the bucket. The bucket is aised by a hoist and dumps into a hute.

Precast Concrete Wells for Irrigation Service

Inlet and outlet structures in the anal system of the Imperial Irrigation District (Calif.) began to be made of precast concrete when war ecessity brought about restrictions n the use of lumber for such purposes. Now that the district has dapted its methods to and is quipped for concrete wells, several dvantages have been demonstrated. The concrete wells cost less, they are ireproof and are considerably more durable than wells made of timber. Those shown in the picture at the upper right were cast in the district's shops; they range in size from 1½x1½ x3 ft. up to 3x3x7 ft.



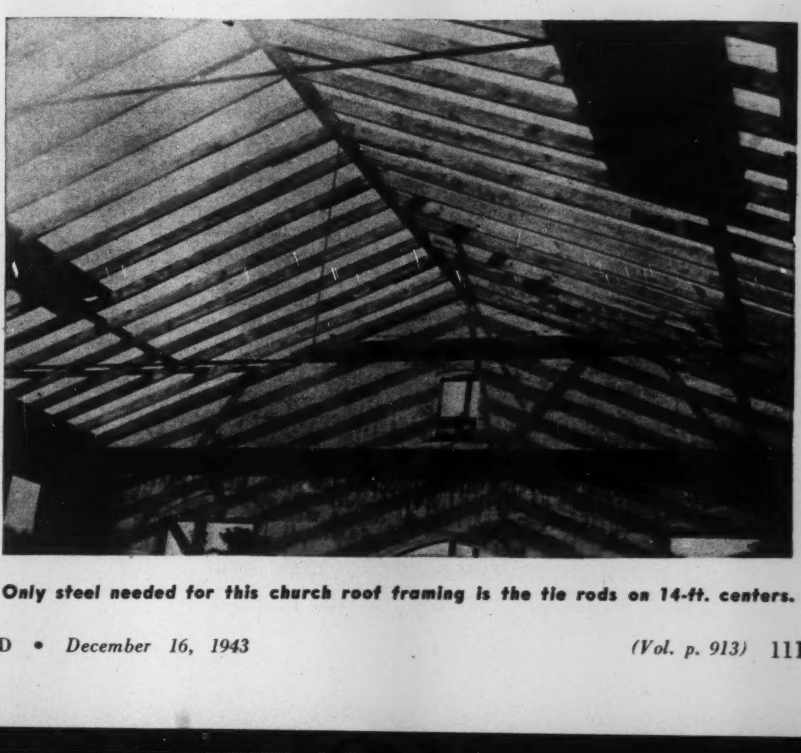
Precast concrete wells after assembly, ready for installation in a canal.

An Economical Roof Design of Timber

A roof design requiring little steel and applicable to a large number of buildings requiring a free span up to about 40 ft. is illustrated by the accompanying photograph. This construction eliminates any form of truss, using only a relatively small tie-rod at about 14-ft. intervals.

The photograph shows the roof framing of the Spiritual Science Church now nearing completion in Jacksonville, Fla. The roof has a clear span of 30 ft. and the 1-in. dia. tie rods are spaced on 14-ft. centers. The rafters are 2 x 6's, on 18-in. centers, with a 2 x 4-in. collar beam near the ridge. Thus, a barrel ceiling, which greatly increases the height of the auditorium, results.

The wall plate is anchored to a reinforced-concrete beam on top of the side walls. This beam is required for cement block walls, and therefore is not added expense.—JOHN GRAVELEY, *architect, Peninsular Life Building, Jacksonville, Fla.*



Only steel needed for this church roof framing is the tie rods on 14-ft. centers.

Courtesy Todd Shipyards Corp.

JOB-MADE DEVICE SPEEDS DRILLING

Greater speed in overhead drilling operations on ship construction is expected by use of the above device. Called the "Lazyman", the gadget is the invention of Evert Dustman, a night worker in the Erie Basin shops of Todd Shipyards Corp. The device consists of an electric drill mounted on long pole adjustable to any height. The drill is conveniently operated by a foot pedal.

Heretofore, when holes were to be drilled in overhead plates at the Erie Basin, a ladder or scaffolding was set up at considerable loss in production time.

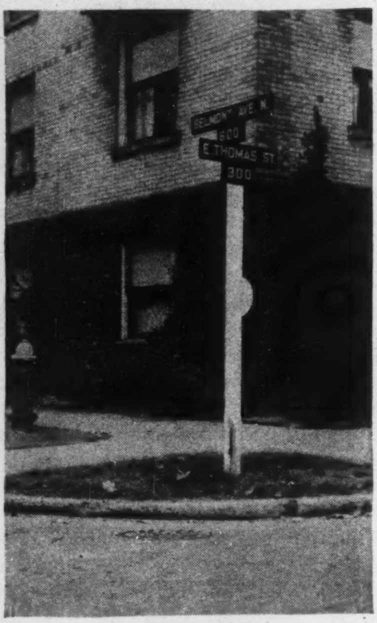
Street Signs of Wood

Wartime necessity that brought back wood street signs in Seattle, Wash., leads to the discovery that these signs are much less attractive as targets for mischievous boys and hence are free from a major cause of short life and maintenance expense. In contrast with the broken enamel which results when rocks are thrown against street signs of the porcelain enamel type, the wood signs suffer no apparent damage to the paint film when rock dents are made as much as ¼ in. deep.

The typical signboard is cedar, 1x6x24 in., primed and given one coat of white enamel on the face, after which the desired name is formed with individual gummed masking letters and then the entire sign is faced with one coat of blue enamel. When thoroughly dry the masking letters and adhesives are removed with a solvent.

The cost of materials averaged 50 cents per sign as compared to about $1.50 for the porcelain enamel type. The labor required need not be skilled.

Many of these signs, after 3 yr. service, are still in excellent condition.



Street names on wood are not easily defaced.

Field and Office Comment

Square Roots by Use of Differential Coefficient

Sir: Reference is made to the Field and Office Comment in *Engineering News-Record*, Aug. 26, 1943, p. 353, which describes a method of extracting the square root by using the differential coefficient as submitted by R. W. Stewart. There appears to be a typographical error in the calculations. The expression

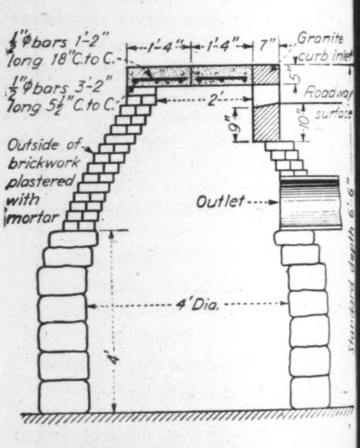
$dx = \frac{0.30}{2(73.2)} = .002049$ is correct as printed, but $72.2 - .002049 = 73.197951$, *not* 73.17951 as printed.

The method appeals to me as a ver clever use of the differential coeff cient. The accuracy is the same as o tained with Vega's seven-place lo arithms; or by the more tediou method of arithmetic. — HARRY SCOTT, *341 South Highland Ave Pittsburgh, Pa.*

Catchbasin Design Saves Steel

Reconstruction of 2.1-mi. section o Route 5 at Springfield, Mass. require a number of catch basins of interes because of the design being followe to save steel. As an accompanyin drawing shows, the vertical walls ar built of concrete block masonry o brick and the cover is of reinforce concrete. For the curb inlet, a granit stone 6 ft. long, 20 in. high and 7 in thick, with an opening 30 in. long and 5 in. high, is employed. No steel trash bars are used across the opening which permits a saving in steel over designs used previously.

The work is being done by Massachusetts State Department of Public Works. The Kelleher Corp., Turners Falls, Mass., is the general contractor.


½"φ bars 1'-2" long 18" C. to C.
½"φ bars 3'-2" long 5½" C. to C.
1'-4"
1'-4"
7"
Granite curb inlet
5"
Roadway surface
2'
9"
10"
Outside of brickwork plastered with mortar
Outlet
4' Dia.
4'
Standard depth 6'-6"

To save steel, catchbasins of the type above are constructed on Massachusetts road jobs. Timber cover, shown by photograph, was installed temporarily to avoid an accident because of an open manhole.

CHECK YOUR OPERATIONS for Maximum Dozer Use

Use this handy LeTourneau check-list

It's planned to cover your complete clearing & earthmoving cycle . . . shows you what to look for at every operating step

It pays to check your equipment operating procedure regularly. If you feel that you're not getting maximum use from your tractor-Dozer rigs, use this simple LeTourneau check-list. It will quickly show you where your job is falling down and what to do to correct the situation.

The Co-Operator

Here's More Help

To keep your tractor operators and repair crews informed on the most practical operating, service and repair practices, The LeTourneau Co-Operator is offered to you and your men FREE. Published 10 times yearly. Read regularly by over 50,000 contractors, miners, loggers and others who operate and care for LeTourneau equipment . . . write for your copies TODAY. Just address: Dept. ENR-12A, R. G. LeTourneau, Inc., Peoria, Illinois.

LeTourneau Dozer building a logging skid road along a steep mountain-side near Disston, Oregon. This smart operator keeps the cut low on the inside next to the bank. This keeps the tractor leaning slightly toward the bank and eliminates tendency for tractor to slip off the edge of the loose fill.

CLEARING . . . *Check These Points* √

1. Use your largest, heaviest tractors and Dozers to take out trees up to 3 feet in diameter. Here's how . . .
2. Check tree to remove dead limbs that might fall and injure operator.
3. Saucer out dirt to cut roots opposite "fall" side of tree.
4. Take a bite on either side of stump to cut and loosen roots.
5. Apply Dozer blade high up trunk for extra leverage and rock tree a few times to loosen—then push tree over and/or . . .
6. Reach blade under root ball for final push.
7. In all clearing and Dozer earthmoving operations, use LeTourneau front end Power Unit wherever possible; this leaves rear of tractor free for mounting LeTourneau 2-drum Power Control Unit to operate Carryalls, Tractor Cranes, etc.

LOADS . . . *Check These Points* √

1. Dozer bowl should always carry a heaping load.
2. Tractor motor should be working under full load by keeping up a full r.p.m.
3. Correctly set the blade—angled or straight, tilted or level—for the work.

TRAVELING . . . *Check These Points* √

1. 1½ m.p.h. travel speed—or low gear—should be used.
2. Back-up should be made in the highest gear possible.
3. Efficient haul distances should be no longer than 200 or 300 feet.
4. Doze loads in a trench or "slot" wherever possible.
5. Always doze downhill with loads. It's almost always possible.
6. Where 2 or more tractors are available—work them side-by-side to move an extra yard or two between Dozer bowls.

SPREADING . . . *Check These Points* √

1. Spread as quickly as possible.
2. Spread earth in lifts or layers as required and get rid of it quickly.
3. As soon as spread is completed, don't waste time beginning back-up or return.

MECHANICAL—*(Check with LeTourneau Maintenance Manuals)*

1. Check all adjustments on Power Control Unit and Dozer.
2. Blades should be installed properly to keep them sharp.
3. Cable must be free from binding and all sheaves running free.
4. Lubricate sheave bearings every 8 hours.
5. If rear Power Control Unit is used, right-hand drum should carry cable.

Check With Your Dealer—**If your check-up shows a need for repairs or parts, call your LeTourneau-"Caterpillar" distributor—he's completely equipped to handle your repair job quickly, thus reduce costly down-time. Check with him NOW**

LETOURNEAU

PEORIA, ILLINOIS — STOCKTON, CALIFORNIA

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

BRIDGE IMPROVEMENTS, WASHINGTON

OWNER: Washington State Highway Dept., Olympia, Burwell Bantz, state highway director.

PROJECT: Grading, surfacing and widening timber bridge in Yakima County, near Moxee, Wash. Length of project is 11.72 miles. Surface course is to be of crushed stone.

CONDITIONS: Contractor to furnish all materials and complete work in 90 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $2.00 per hour; semi-skilled, $1.50; and common, $1.00.

BIDS: Three bids were received late in August, 1943, ranging from the contract low of $118,232 to $159,978.

LIST OF BIDDERS:

1. M. J. Kuney Co., Spokane, Wash. (contract)	$118,232
2. S. Birch & Sons Constr. Co., Great Falls, Mont	132,688
3. Diesel Oil Sales Co., Seattle, Wash	159,978

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grading	Lump Sum	$1,200.00	$2,500.00	$1,000.00
2. Common excav., inc. haul	45,930 c. y.	.45	.60	.40
3. Solid rock excav., inc. haul	1,500 c. y.	1.00	1.50	1.20
4. Common trench excav., inc. haul	915 c. y.	1.00	1.00	2.50
5. Structural excavation	680 c. y.	2.00	3.00	3.00
6. Ballast on roadway	13,050 c. y.	1.50	1.50	2.30
7. Cr. stone surf. top course	18,470 c. y.	1.85	1.95	3.15
8. Cr. stone surf. top, stockpile	1,500 c. y.	1.65	1.85	2.00
9. Water	4,670 M. gal.	3.50	4.75	5.00
10. Cr. cover stone in stockpile	3,300 c. y.	3.00	2.05	2.60
11. Conc. Class F	2 c. y.	50.00	50.00	100.00
12. Timber and lumber (untreated)	2.5 Mbm.	120.00	140.00	170.00
13. Pl. concr. or V. C. culv., 12-in.	180 ft.	1.35	1.40	1.80
14. Std. reinf. concr. culv., 18-in.	1,728 ft.	3.00	3.00	3.00
15. Std. reinf. concr. culv., 24-in.	150 ft.	4.15	4.35	4.50
16. Std. reinf. concr. culv., 30-in.	127 ft.	5.05	5.85	6.50
17. Std. reinf. concr. culv., 36-in.	184 ft.	7.50	7.50	9.00
18. Std. reinf. concr. culv., 42-in.	88 ft.	10.50	9.35	12.00
19. Std. reinf. concr. culv., 48-in.	56 ft.	12.00	11.20	18.00

WATERWORKS AND SEWERAGE SYSTEM PORT NECHES, TEXAS

OWNER: Federal Works Agency, Fort Worth, Tex.

PROJECT: Construction of waterworks system and sewerage system in Port Neches, Tex. including filtration plant complete with mixing chamber, settling basins, filters, clear well, all pumps and equipment ready for operation; pump house complete with pumps and equipment and power line; intake mains, pipe and fittings; vitrified clay sewer lines and fittings; manholes; concrete headwalls at river outlet; and sewer lift station with pumps and equipment ready for use.

CONDITIONS: Contractor to furnish all materials and complete work in 120 calendar days. Considerable wet trenching is expected to be encountered due to the location of the project. Rail, water and highway transportation facilities available for transportation. Wage rates are: skilled labor, $1.75 per hour; semi-skilled, $1.25; and common, 60c.

BIDS: Six bids were received October 6, 1943. Four of the five contractors bid on all three schedules, and one bid on the first and second schedules and one on the second and third. Low bid on the combination of the three schedules was $169,539 and the high was $200,000.

LIST OF BIDDERS:

(Combination of three schedules).

1. Thomas Bates & Son, Houston, Tex. (low bidder)	$169,539
2. Williams & Whittle, Inc., Dallas, Tex	176,980
3. Hake Constr. Co., Houston, Tex	193,039
4. English & Wilson, San Antonio, Tex	200,000

Sections I and II

1. Mitchell Darby, Pharr, Tex	$133,800
2. English & Wilson, San Antonio, Tex	145,000
3. Hake Constr. Co., Houston, Tex	152,050

Sections II and III

1. Hake Constr. Co., Houston, Tex	$88,839
2. Beaumont Constr. Co., Beaumont, Tex	99,077
3. English & Wilson, San Antonio, Tex	110,000

Section I—Filtration Plant

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Filtration plant, complete with mixing chamber, settling basins, filter, clear well, all pumps and equipt., ready for operation	Lump Sum	$67,000.00	$80,000.00	$104,200.00

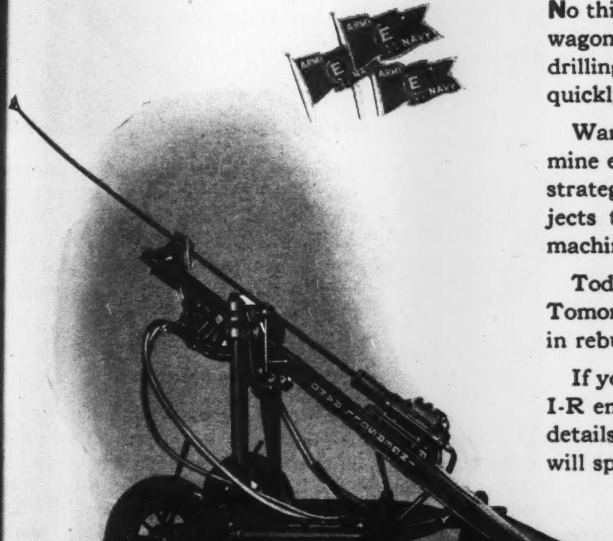
Section II—Pump House and Water Lines

Item	Quan.	(1)	(2)	(3)
1. Canal pump house, complete with pumps and equipment, and power line	Lump Sum	8,340.00	7,600.00	7,800.00
2. 12-in. cast iron pipe line	2,400 l. f.	4.00	3.36	3.50
3. 10-in. cast iron pipe line	580 l. f.	3.30	2.70	2.85
4. 6-in. cast iron pipe line	10,260 l. f.	2.30	1.64	1.80
5. 3-in. cast iron pipe line	4,900 l. f.	1.80	1.13	1.20
6. 12x12x12x12-in. c. i. cross, all bell	1 ea.	63.00	60.00	77.50
7. 90-deg. c. i. ell, bell to bell	3 ea.	37.00	36.00	42.00
8. 12 to 6-in. c. i. reducer, bell to spigot	1 ea.	22.00	20.00	31.80
9. 6-in. cast iron tee, all bell	30 ea.	20.00	18.00	21.00
10. 6-in. cast iron sleeve	1 ea.	13.00	8.00	7.40
11. Cast iron tee, 12x6x12-in.	1 ea.	46.00	40.00	48.75
12. Cast iron tee, 10x8x10-in. all bell	1 ea.	36.00	33.00	43.35
13. Cast iron cross, 10x10x6x6-in., all bell	1 ea.	41.00	36.00	55.10
14. Cast iron tees, 6x4x6-in., all bell	3 ea.	18.00	18.00	13.50
15. Cast iron cross, 6-in., all bell	2 ea.	26.00	24.00	35.20
16. Cast iron cross, 6x6x4x4-in., all bell	2 ea.	22.00	20.00	30.95
17. 22½-deg. 6-in. c. i. ell	2 ea.	14.00	10.00	13.30
18. 22½-deg. 3-in. c. i. ell	1 ea.	7.00	6.00	8.30
19. 10x6-in. c. i. reducer	1 ea.	18.00	28.00	22.90
20. 6x4-in. c. i. reducer	7 ea.	12.00	10.00	11.30
21. 6x3-in. c. i. reducer	6 ea.	11.00	9.00	11.30
22. 4x2-in. c. i. reducer	6 ea.	5.00	5.00	6.80
23. 8-in. cast iron sleeves	1 ea.	12.00	10.00	11.75
24. 6-in. cast iron sleeves	9 ea.	9.00	8.00	9.10
25. 4-in. cast iron sleeves	6 ea.	6.00	6.00	7.50
26. 6-in. cast iron plugs	3 ea.	2.00	3.00	3.40
27. 12-in. check valves, bell	2 ea.	180.00	160.00	235.00
28. 6-in. check valve	1 ea.	50.00	50.00	51.75
29. 12-in. gate valves	2 ea.	135.00	140.00	151.25
30. 10-in. gate valve	1 ea.	110.00	100.00	122.50
31. 8-in. gate valve	1 ea.	72.00	70.00	80.00
32. 6-in. gate valves	17 ea.	50.00	50.00	50.00
33. 4-in. gate valves	2 ea.	38.00	40.00	33.75
34. 3-in. gate valves	2 ea.	33.00	30.00	28.75
35. Hydrants	16 ea.	110.00	110.00	128.75

Section III—Sewer Line and Lift Station

Item	Quan.	(1)	(2)	(3)
1. 6-in. vit. clay sewer line, 0 to 4-ft.	3,660 l. f.	.90	.80	84
2. 6-in. vit. clay sew. line, 4 to 6-ft.	2,030 l. f.	1.10	.95	1.04
3. 6-in. vit. clay sew. line, 6 to 8-ft.	330 l. f.	1.50	1.30	1.24
4. 8-in. vit. clay sew. line, 0 to 4-ft.	280 l. f.	1.50	1.00	1.06
5. 8-in. vit. clay sewl line, 4 to 6-ft.	225 l. f.	1.60	1.20	1.26
6. 8-in. vit. clay sew. line, 6 to 8-ft.	425 l. f.	1.80	1.50	1.46
7. 10-in. vit. clay sew. line, 8 to 10-ft.	870 l. f.	3.10	5.00	1.98
8. 10-in. cit. clay sew. line, 10 to 12-ft.	1,435 l. f.	3.20	5.10	2.18
9. 12-in. vit. clay sew. line, 0 to 4-ft.	1,365 l. f.	2.00	1.50	1.86
10. 12-in. vit. clay sew. line, 4 to 6-ft.	350 l. f.	3.00	1.70	2.01
11. 12-in. vit. clay sew. line, 6 to 8-ft.	260 l. f.	3.10	2.10	2.38
12. 12-in. vit. clay sew. line, 8 to 10-ft.	775 l. f.	3.20	5.10	2.73
13. 12-in. vit. clay sew. line, 10 to 12-ft.	1,525 l. f.	3.40	5.30	2.94
14. 12-in. vit. clay sew. line, 12 to 14-ft.	1,740 l. f.	3.60	5.60	3.26
15. 6-in. wyes with plugs	180 ea.	2.00	2.00	1.50
16. 8-in. wyes with plugs	10 ea.	2.50	2.50	2.60
17. 10-in. wyes with plugs	15 ea.	3.00	3.00	3.65
18. 12-in. wyes with plugs	64 ea.	3.50	4.00	4.50
19. 5-ft. chimneys, 6-in. plugs	20 ea.	12.00	2.00	7.50
20. Manhole, with cover, 0 to 4-ft.	14 ea.	80.00	75.00	70.00
21. Manhole, with cover, 4 to 6-ft.	5 ea.	90.00	82.00	75.00
22. Manhole, with cover, 6 to 8-ft.	2 ea.	100.00	90.00	115.00
23. Manhole, with cover, 8 to 10-ft.	6 ea.	120.00	97.00	145.00
24. Manhole, with cover, 10 to 12-ft.	11 ea.	140.00	104.00	187.50
25. Manhole, with cover, 12 to 14-ft.	2 ea.	160.00	112.00	245.00
26. Conc. in headwalls at river outlet	5 c. y.	65.00	50.00	30.00
27. 12-in. cast iron pipe at river outlet	32 l. f.	6.00	10.00	7.80
28. Sewer lift station, complete with pumps and equip. connected and ready for use	Lump Sum	6,070.00	4,500.00	7,000.00

A SECRET WEAPON
?



No this isn't a secret type of anti-aircraft gun. It is an FM-2 wagon-mounted rock drill designed especially for deep hole drilling. It is unusually flexible, can be moved from hole to hole quickly and can be set up so as to drill holes at any angle.

War could not be waged without rock drills, since they help mine essential ores, build landing fields for planes, construct strategic highways and help build giant hydroelectric projects to supply the power that keeps our war production machines rolling at an ever increasing tempo.

Today rock drills are helping us win the fight for freedom. Tomorrow when peace arrives, they will be just as useful in rebuilding the war-torn nations of the world.

If you have a problem which requires deep hole drilling, the I-R engineering service division nearest you can supply full details. And our engineers can also show you how Jackbits will speed up your job.

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COMPRESSORS • TURBO BLOWERS • ROCK DRILLS • AIR TOOLS • OIL AND GAS ENGINES • CONDENSERS • CENTRIFUGAL PUMPS

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to build an efficient
AIR COMPRESSOR

★

Your Model A or B Ford Motor
and a

SMITH
COMPRESSOR HEAD

and Accessories

is all you need!

We furnish the following parts:

Smith Compressor Head fitted with high speed compressor valves and all other necessary parts such as motor governor, pilot valve, unloading and idling devices, air receiver, pop-off valve, pressure gauge, air cleaners for compressor cylinders and carburetor, axle and springs, tow connection and tool box.

You furnish the Ford Model A or B engine and also the Model A frame, hood, cowl, radiator and wheels.

You'll have a 60 cu. ft. Compressor with governed speed and automatic unloading and idling. You'll have all the power needed for a majority of compressor work. Thousands of compressors made with a Smith Compressor Head and Accessories are performing vital service for users the country over. Detailed instructions and drawings are furnished. Write, phone or wire, NOW!

GORDON
Smith
& CO. Incorporated

430 College St., Bowling Green, Ky.

NEW AIDS TO THE CONSTRUCTOR

Drop-Bottom Skid Box

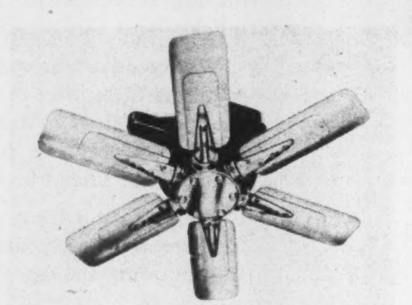
Fast, efficient handling of small parts in bulk is aided by the new drop-bottom dump skid box, according to the manufacturer's announcement. Used with a Towmotor lift truck, the metal skid box is large and strong enough to carry the equivalent of several hand-truck loads.

The skid box, available in several sizes, is carried at normal level to the point of unloading, where it is lifted toward the top of the Towmotor hoist, and the back of the box secured by loops to the upper cross-arm. When the forks are lowered, the load is dumped. The entire operation takes only a few seconds, it is claimed.—*Union Metal Manufacturing Co., Canton, Ohio.*

• • •

Engine Fan Kit

An extremely compact assembly is possible for an improved, controllable-pitch blade fan kit, because the controlling thermal element is direct-connected through the span spindle to the blade-turning mechanism, according to the manufacturer's announcement. The entirely automatic variable-pitch fan is actuated by a thermostatic element directly controlled by the temperature of bypassed engine jacket water; as engine temperature goes up, the fan blade pitch increases. When the engine is cold, the fan blades remain at zero or low pitch until correct operating temperature is reached.

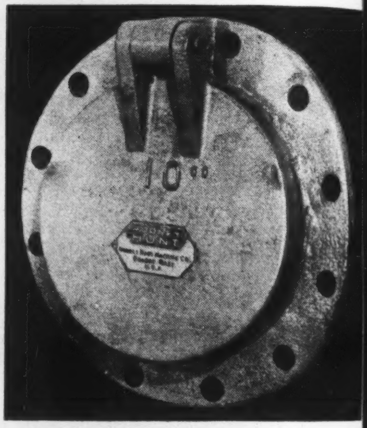


The fan blades feather from practically zero to as much as 38 deg. pitch, and are said to hold engine temperatures within safe, narrow ranges under all load and climate conditions. The fan units may be used for gasoline, natural gas and Diesel engines with resultant reduction of lubrication oil consumption and engine repairs.—*Kontrol Fan, Inc., 403 Goodwin Ave., Los Angeles 26, Calif.*

• • •

Shallow Flap Valve

To meet the need for a flap valve of exceptional strength that is also extremely shallow in depth, a new unit has been developed for use in floating drydocks. According to the manufacturer's announcement, the valve is built for salt water service. Its design prevents the unit from protruding into the water and interfering with passing ships.—*Rodney Hunt Machine Co., Orange, Mass.*



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Luminaire

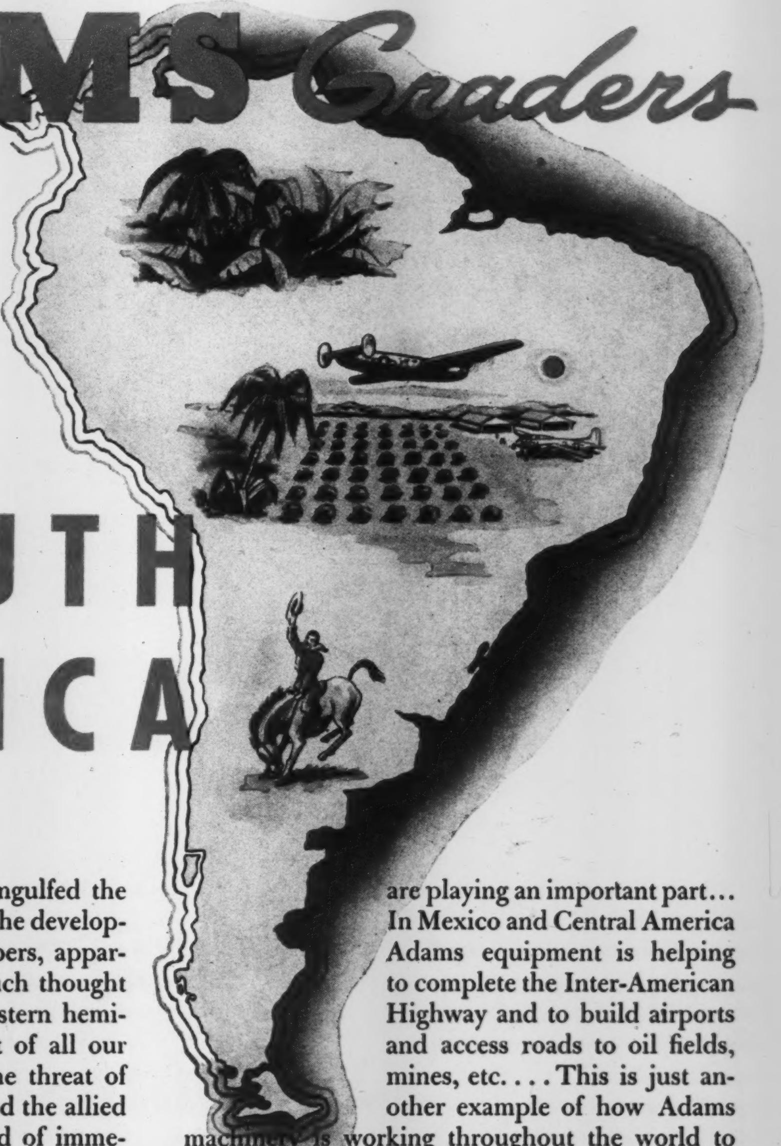
Designed for easy continuous strip installation, a new light-weight fluorescent luminaire has been announced. This type FNC luminaire, for use with four or six 40-watt, or four 100-watt Mazda F lamps, is the equivalent of two conventional units. It is equipped with a one-piece, double-length hood, and two full-size reflectors.

The hood, of sheet steel, has all ballasts; lamp holders and starter sockets

ADAMS *Graders*

Work for the Defense of the Western Hemisphere

IN SOUTH AMERICA

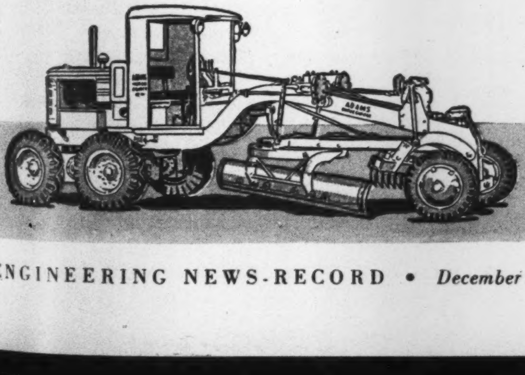


UNTIL the present war engulfed the world and brought about the development of long range bombers, apparently no one gave too much thought to the invasion of the western hemisphere by a European power—least of all our neighbors to the south. Last year the threat of such an invasion from Africa awakened the allied nations in South America to the need of immediate development of military highways and airports, so, scores of Adams machines already on the continent were put to work on such projects . . . Not only did these military necessities loom up but closer economic collaboration with these countries has resulted in the greater development of roads and airports for the procurement of natural resources including much needed rubber and quartz. In these developments Adams graders are playing an important part... In Mexico and Central America Adams equipment is helping to complete the Inter-American Highway and to build airports and access roads to oil fields, mines, etc. . . . This is just another example of how Adams machinery is working throughout the world to bring the war to a successful conclusion and to build for a better world of peace . . . When peace comes you will do well to look to Adams for the new machines you will need to follow your peaceful pursuits.

J. D. ADAMS COMPANY, INDIANAPOLIS, INDIANA
Sales and Service Throughout the World

Adams

ROAD BUILDING • EARTH MOVING EQUIPMENT



Motor Graders • Leaning Wheel Graders
Elevating Graders • Hauling Scrapers • Etc.

Whenever you face a

Tough pumping job...

Remember . . .

CARVER Certified PUMPS

Model A-25212 (10,000 GPH) on a tough airport dewatering job.

IF you buy equipment that licks the *tough* jobs, you never need worry about the easy ones. In pumps, that means CARVER—the pump designed, built and performance-proved for the really tough pumping jobs. Sizes run from 3,000 to 125,000 GPH. See your distributor for details—NOW!

THE CARVER PUMP CO.
Muscatine, Iowa

FOR VICTORY BUY UNITED STATES SAVINGS BONDS AND STAMPS

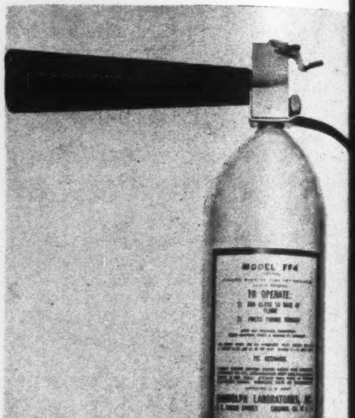
CARVER CENTRIFUGAL Certified PUMPS

mounted and wired as part of the chann assembly. New sliding hangers perm suspension from any part of the hoo and mounting arrangements are availab for any application. The moisture-r sistant, non-metallic reflector is cover with a multi-coat polymerized finis which is said to provide a reflection fact of 85 percent or more. It is easily remo able for cleaning.—*Westinghouse El tric & Mfg. Co., Lighting Division, Edg water Park, Cleveland, Ohio.*

• • •

Portable Fire Extinguisher

Sharpshooting at flames may be do with the latest Model FF-4 carbon d oxide fire extinguisher. Designed for on hand operation, the extinguisher has self-aimed, fixed discharge horn and



thumb-operated trigger valve that r leases the carbon dioxide gas.

This fire-fighting device weighs only lb., and is completely safe to operat The carbon dioxide gas will not har flesh, clothing nor electrical equipment, is claimed, and will extinguish flam with remarkable speed.—*Randolph L boratories, Inc., 8 East Kinzie St., Ch cago, Ill.*

• • •

Loader

Developed for use with large-capaci hauling equipment, a new Model B loader is said to be very versatile. Onl one operator is needed for both puller tractor and loader. Because of a wid cutting blade with plow point, mol board and 54-in. belt, hauling units ma be loaded in a shorter travel distance The loader can work in narrow cuts, eve with large hauling units, and it cu

HERE'S HELP FOR CONTRACTORS AND ENGINEERS

WOOD ROAD-MIX *ONE-PASS* MIXING will boost production and cut completion time on *any* paving job—

When you get better than 2000 tons of mix per 8-hour day in ONE PASS, you get your job done quicker, with less manpower and less equipment.

That's how Wood Road-Mix methods of pavement construction, utilizing the Wood Roadmixer, are helping contractors and engineers in these days of labor and equipment shortages.

Employing the traveling plant method of pavement construction, the Wood Roadmixer delivers highest production of emulsion, road-oil or soil-cement mix in ONE PASS. Yet two men, a tractor and a binder supply truck can handle the average job.

ONE-PASS mixing is the secret—no passing and re-passing. Wood Roadmixer's synchronized travel speed and mixing action, plus accurate binder volume control have made this pioneer equipment the world's leading, low-cost mix-in-place method of pavement construction.

If you want help *now*, write for bulletin and prices on the Wood Roadmixer.

Dealerships for this popular roadbuilding equipment are now available to qualified dealers. . . . Write for particulars.

➡ ➡ ➡ **DESIGN FOR ROAD-MIX**

Write for detailed and illustrated Wood Roadmixer bulletin, "The Fastest Method of Low-Cost Paving."

WOOD ROADMIXER

Wood Manufacturing Co. • 816 West 8th St., Los Angeles 13, California

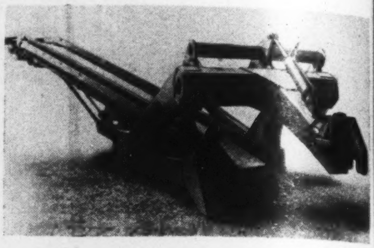
Fuller
IS A GOOD GEAR BOX
Fuller
TRANSMISSIONS

That's what one operator who has well over a hundred hard-working trucks said about his Fuller Transmissions . . . and he put all the emphasis on the "good." What he could have added was that his records proved it . . . proved it by the few gears which had to be replaced, by less "time out" . . . more pay-load truck hours available. During the past year, we have told you about *quiet running* and its relation to *wear-life.* During the months to come, we're going to give you some additional reasons why your new trucks should be equipped with Fuller Transmissions . . . but don't forget: "quiet running means less wear . . . longer gear-life."

FULLER MANUFACTURING CO., KALAMAZOO, MICH.
Transmission Division
Unit Drop Forge Division, Milwaukee, Wisconsin

through surface contours, leaving a clean, smooth cut.

The loader is of sturdy construction, with main frame, drawbar and drawbar yoke of welded box design. The conveyor frame is formed steel of welded construction. The net operating weight of the loader, not including the puller tractor, is 40,000 lb.—*Euclid Road Machinery Co., Cleveland 17, Ohio.*



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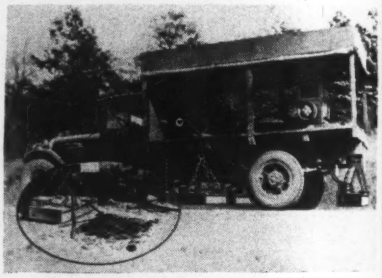
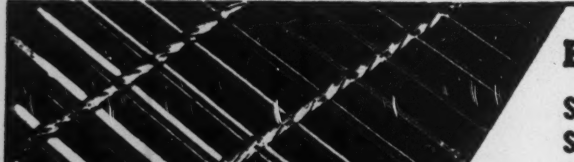
Road Cleaning Magnet

Large amounts of nails and metal refuse of many types may be picked up from runway and road surfaces by a new road-cleaning magnet, the manufacturer announces. Three magnets, mounted on a truck, can cover a road span of 8 to 9 ft. The magnet works best when suspended 2 to 3 in. above the road surface, as it tends then to draw subsurface material from loose ground.



Elastically designed to respond to the particular use needed, the magnet is rugged in appearance, and capable of



BLAW-KNOX Electroforged STEEL GRATING

SAFE—Twisted bar does the trick
STRONG—One-Piece Electroforged
CLEAN—No sharp angles to clog
EASY TO PAINT—All surfaces accessible
OPEN FOR LIGHT & AIR—Maximum open area

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Blaw-Knox Division of Blaw-Knox Company
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Tarpaulin Distributors

YOUR GUARANTEE
GENUINE
PARA
PURE PARAFFIN
BASE
WATERPROOF TREATMENT

TARPAULIN DISTRIBUTORS

1—ALABAMA
Moore-Handley Hardware Co., Birmingham
Owen-Richards Co., Birmingham

2—ARIZONA
O. S. Stapley Co., Phoenix

3—ARKANSAS
Speer Hardware Co., Fort Smith
R. A. Young & Son, Fort Smith

4—CALIFORNIA
Industrial Equipment Co., Los Angeles
Industrial Equipment Co., Oakland

5—COLORADO
Durango Mercantile Co., Durango

6—CONNECTICUT
Gesner Equipment Corp., Hamden

7—DISTRICT OF COLUMBIA
Hudson Supply & Equipment Co., Washington, D. C.

8—FLORIDA
I. W. Phillips & Co., Tampa

9—GEORGIA
Beck & Gregg Hardware Co., Atlanta

10—ILLINOIS
Becker Equipment & Supply Co., Chicago
Clark & Barlow Hardware Co., Chicago

11—INDIANA
Standard Equipment & Supply Co., Hammond
Van Camp Hardware & Iron Co., Indianapolis

12—IOWA
Harry Alter & Sons, Davenport
Pecaut Industrial Supply Co., Sioux City

13—LOUISIANA
C. T. Patterson Co., Inc., New Orleans
Pelican Well Tool & Supply Co., Shreveport

14—MARYLAND
General Supply & Equipment Co., Baltimore

15—MASSACHUSETTS
Hedge & Mattheis Co., Boston
Parker-Danner Co., Boston

16—MICHIGAN
Eddy & Cuthbert, Lansing
C. L. Gransden & Co., Detroit
Krueger Machinery Co., Saginaw

17—MINNESOTA
Thorman W. Rosholt Co., Minneapolis

18—MISSISSIPPI
Contractors Material Co., Jackson

19—MISSOURI
Brown-Strauss Corp., Kansas City
The Victor L. Phillips Co., Kansas City

20—MONTANA
Billings Hardware Co., Billings
A. M. Holter Hardware Co., Helena
Marshall-Wells Co., Billings

21—NEBRASKA
Anderson Equipment Co., Omaha

22—NEW JERSEY
Dale & Rankin, Inc., Newark

23—NEW MEXICO
Charles Ilfeld Co., Albuquerque

24—NEW YORK
Keystone Builders Supply Co., Rochester
New & Used Equipment Co., Long Island
Rupp Equipment Co., Buffalo
Syracuse Lumber Co., Syracuse
Trevor Corp., Buffalo
J. H. Welch Co., Inc., Buffalo
R. B. Wing & Son Corp., Albany

25—NORTH CAROLINA
Constructors Supply Co., Inc., Durham
Contractors Service Co., Charlotte

26—OHIO
Moriarty Machinery Co., Toledo
The W. T. Walsh Equipment Co., Cleveland

27—OKLAHOMA
Leland Equipment Co., Tulsa
Mideke Supply Co., Oklahoma City
The Victor L. Phillips Co., Oklahoma City

28—OREGON
May Hardware Co., Portland
Woodbury & Co., Portland

29—PENNSYLVANIA
Austin Supply Co., Philadelphia
Dravo-Doyle Co., Pittsburgh

30—SOUTH CAROLINA
C. D. Franke & Co., Inc., Charleston

31—SOUTH DAKOTA
The Dakota Iron Store, Sioux Falls

32—TENNESSEE
Keith-Simmons Co., Inc., Nashville
C. M. McClung & Co., Inc., Knoxville
Orgill Brothers & Co., Memphis
Stratton-Warren Hardware Co., Memphis

33—TEXAS
Amarillo Hardware Co., Amarillo
Peden Iron & Steel Co., Houston
W. H. Richardson Hardware Co., Austin
Sabine Supply Co., Orange
The Walter Tips Co., Austin
Zork Hardware Co., El Paso

34—UTAH
Geo. A. Lowe Co., Ogden
Strevell-Paterson Hardware Co., Salt Lake City

35—VIRGINIA
B. T. Crump Co., Inc., Richmond
Noland Co., Inc., Newport News

36—WASHINGTON
Hardware Distributing Co., Seattle

37—WEST VIRGINIA
West Virginia Tractor Equipment Co., Charleston

38—WISCONSIN
Hunter Tractor & Machinery Co., Milwaukee

14

COMPANY

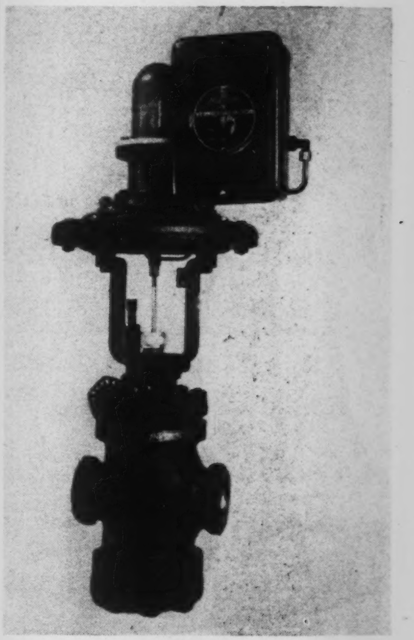
YOUR GUARANTEE
GENUINE
PARA
PURE PARAFFIN
BASE
WATERPROOF TREATMENT

heavy work, it is claimed. An ordinary farm generator plant may be used to supply the necessary power.—*Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1, Wis.*

• • •

Valvactor

A completely different arrangement of actuating elements is said to be the outstanding feature of the new Foxboro Vernier Valvactor—a micro-positioner for pneumatic motor valves. This instrument is used to insure precise and dependable valve response; it is actuated by air pressure changes as slight as the equivalent of ½ inch of water, and can compel valve stem movements as small as 1/1000 of an inch.



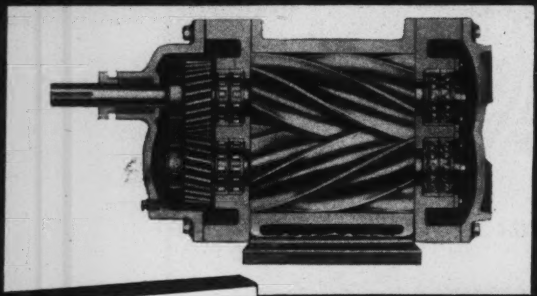
The new arrangement of the elements, it is claimed, adds ease and range of adjustment and reversal. The unit has flexure type bearings, to eliminate the effects of mechanical vibration; its heavy metal case is rugged.—*The Foxboro Co., Foxboro, Mass.*

• • •

Band Filer

Comparatively unskilled labor can get excellent results with a new low-cost, continuous-band filing machine, according to the manufacturer's announcement. Smooth finishes with tolerances of .001 in. may be obtained, with work pressures and filing speeds under the operator's absolute control.

The band filer, using DoALL precision file bands, doubles output, because the continuous filing operation cuts all the time. Twelve different types and sizes of file bands are available—ovals, half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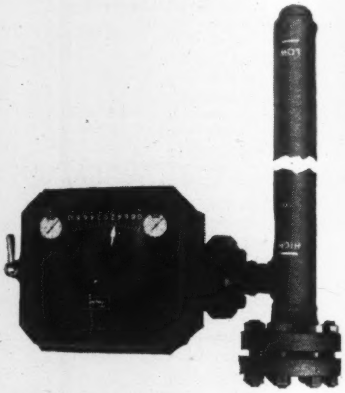
ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

rounds or flats, from ¼ to [illegible] in. wide. The filer is an all steel welded machine, with a 15½-in. throat and 6-in. thickness capacity. "Speedmaster" variable speed pulleys give any cutting speed from 50 to 250 f.p.m. — *Continental Machines, Inc., 1301 Washington Ave., South, Minneapolis 4, Minn.*

• • •

Liquid Level Control and Indicator

A recent addition to the manufacturer's line of industrial instruments is "Level-Buoy", a buoyancy-type instrument which both controls and indicates liquid level. It handles liquids with specific gravities between .2 and 2.0, and is available in 14, 32, 60, 72 and 120-in. standard ranges.



In this device, a torque tube which transmits the level changes to the instrument mechanism eliminates need for a stuffing box, and gives a closed, leakproof system. This tube is interchangeable with ones used in the Taylor aneroid manometer, and has no internal pivots to cause friction or wear.—*Taylor Instrument Companies, P. O. Box 110, Rochester 1, N. Y.*

• • •

Flaring Tool

Designed specifically for plastic tubing, a new flaring tool, No. 175-FP, produces an approved-type, double-thickness flare. One tool handles ⅜, ½, ⅝ and ¾-in. outside diameter tubing, and while it is intended especially for .062-in. wall tubing, it will also handle .031-in. wall.

The small tool folds the plastic tubing back at the ends to form a flare with double-thick, double-strength walls. This double flare, it is claimed, makes joints with 35 percent greater resistance to pull-out; it retains its shape after flaring, and protects the tubing wall from being squeezed too thin. The complete tool consists of flaring bar, yoke with swivel cone, and four adapters, all in a metal kit.—*The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.*

A BEAR FOR FAST LOADING

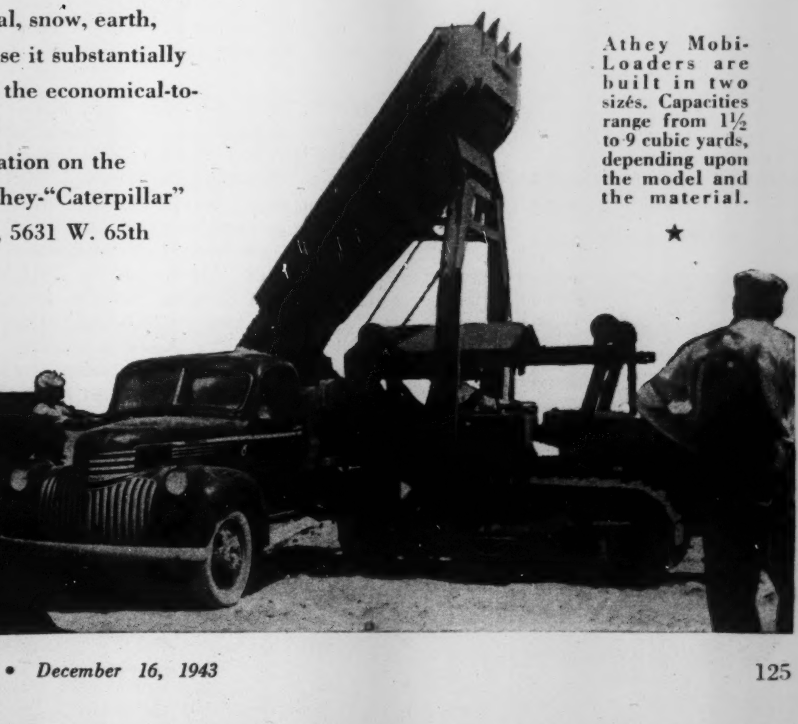
Loading Bauxite ore for Bauxite Co. of Alabama with Athey W4-1 MobiLoader. 4-yard trucks are loaded in less than 2 minutes this fast, simple way.

The closing year goes down in history as a year for speed in construction. In jumping ahead of the Axis nations on every score, fast production was essential. A time-saving tool that gained scores of new friends on the military and home front is the Athey MobiLoader. It's *fast*, because it's an overhead loader that digs and hauls bigger loads with no waste motions. It goes forward into a stockpile, with bucket down to dig its load, and travels directly back in reverse, discharging the material into the truck or fill. *Versatile*, because it can load a wide range of materials, including gravel, ore, coal, snow, earth, crushed stone, etc. *Economical*, because it substantially reduces loading time and works with the economical-to-operate "Caterpillar" Diesel Tractor.

Why not write a note for full information on the Athey MobiLoader, either to your Athey-"Caterpillar" Dealer, or to Athey Truss Wheel Co., 5631 W. 65th Street, Chicago, Illinois.

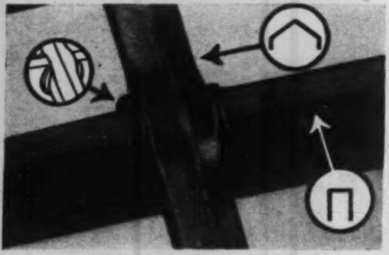
Athey Mobi-Loaders are built in two sizes. Capacities range from 1½ to 9 cubic yards, depending upon the model and the material.

★



Athey

MOBILOADERS



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● The story is easily read in the above unretouched photograph of a small section of **BATES•GRATES.**

The ridge on the cross bar is the peak of the cold-rolled steel cross bar that is low-temperature pressure-welded to the rectangular main bar.

The large, smooth fillet is also the result of the happy combination of design, process and plenty of experience with both.

The booklet illustrated below gives you the facts about the one type of Open Steel Flooring and Stair Treads designed to shed water and oil, that is so made that there are no cracks, fissures or joints in which water or oil can lodge and that provides a crisp, clean, non-slip tread on all its cross bars. Write for a copy.

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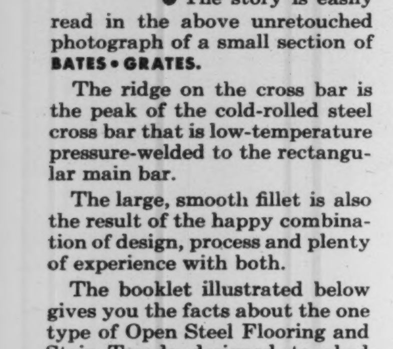

MANUFACTURERS' ACTIVITIES

V. A. Guebard, former superintendent of the Milwaukee works of the International Hardware Co., has been appointed works manager for the firm's truck plants. He started with the company in 1927 as a tool designer, was made assistant mechanical engineer at Fort Wayne in 1934 and several years later was made mechanical engineer. In 1937 he was appointed second assistant superintendent of the Milwaukee shops and has been at the head of the Milwaukee manufacturing end since 1941.

The appointment of P. W. Stickney as sales representative for the Allen Corp., manufacturers of industrial ventilation equipment, has been announced by B. K. Paget, sales manager of the corporation. Mr. Stickney, whose office is located at 549 West Washington Blvd., Chicago, will cover the industrial district of the Chicago territory, where Mr. Stickney and his organization are well known. They have rendered engineering service to architects, contractors, builders, and the plumbing, heating and ventilating trade in that area for a number of years. Associated with Mr. Stickney are R. G. Rosenbach, designing engineer, and two sales engineers, B. B. Harter and M. A. Norman.

Joseph S. Helm, for many years manager of the asphalt sales department of the Standard Oil Co. of New Jersey, is now on leave of absence, and will retire from active duty in April of next year, having completed 34 years of service. He was one of the organizers of the Asphalt Association in 1918, and has been a director from the first, and is also a former president. The asphalt industry has shown a remarkable growth. In 25 years its sales have increased from 1,500,000 tons to 8,000,000 tons, or over 500 percent.

Harry C. Merritt, 62, former vice-president and general manager of the Allis-Chalmers Mfg. Co., tractor division in Milwaukee, Wis., died Nov. 17 at his home near Littleton, Ill. He first joined the Allis-Chalmers Co. as branch manager in 1923 and three years later was

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Memphis — Tri-State Equipment Company
TEXAS — Dallas — Shaw Equipment Company
El Paso — Equipment Supply Co.
Houston — Dye Welding Supply Co.
San Antonio — Patten Machinery Company
UTAH — Salt Lake City — The Lang Co.
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Richmond — Highway Machinery & Supply Co.
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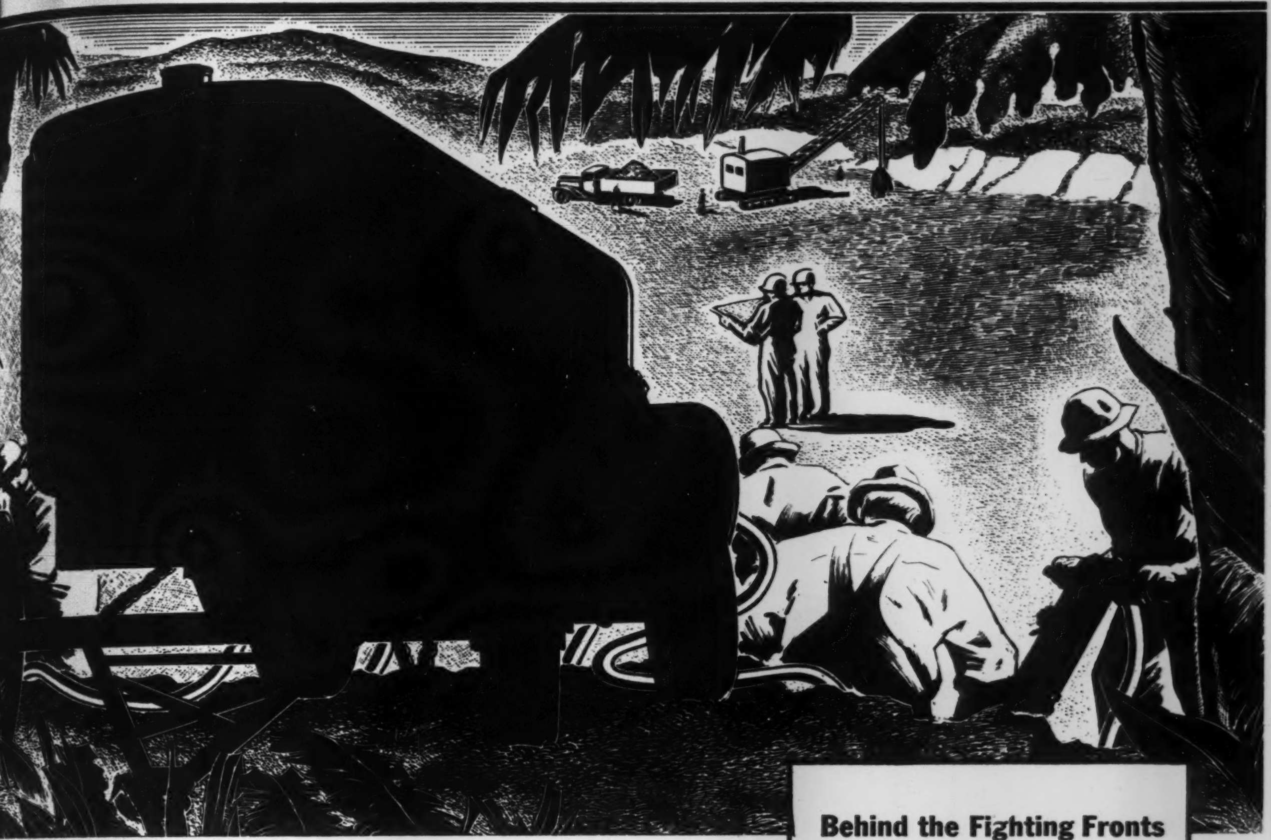

usky, big-lunged compressors, broth- to this Blue Brute, have helped build e than 100 airdromes in the South ific since the war began. Easy-breath- Feather Valves* keep their throats r for trouble-free air-delivery.

hen *you* get a demonstration of this foot Blue Brute, you'll find a compact cylinder compressor driven by a 150 hp sel . . . convenient controls . . . special bath air-cleaners on each bank of L-P inders . . . an 85-gallon fuel tank. 'll get the sense of Worthington lity with extra precision, extra air power and plenty of staying power.

Construction jobs at home are often vital to keep U. S. eagles flying across the sea. Other Worthington Blue Brute Compressors . . . portable, semi-portable . . . gasoline, Diesel and electric-driven . . . save time and money on jobs where a failure may break a wartime life line — or a contract.

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Remember the road that was "impossible" to build? On the 1670 mile Alaskan highway, heroic Army engineers worked 10 and 12 hours a day through temperatures as low as 70° below zero. We're glad Blue Brutes** were also there, doing their part, as in hundreds of Army camps, Navy yards, air bases and ordnance plants behind the lines. Your nearest distributor is listed on page 126.

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ie Brute Compressors and Air Tools are painted olive drab for the Army, battleship gray for the Navy.

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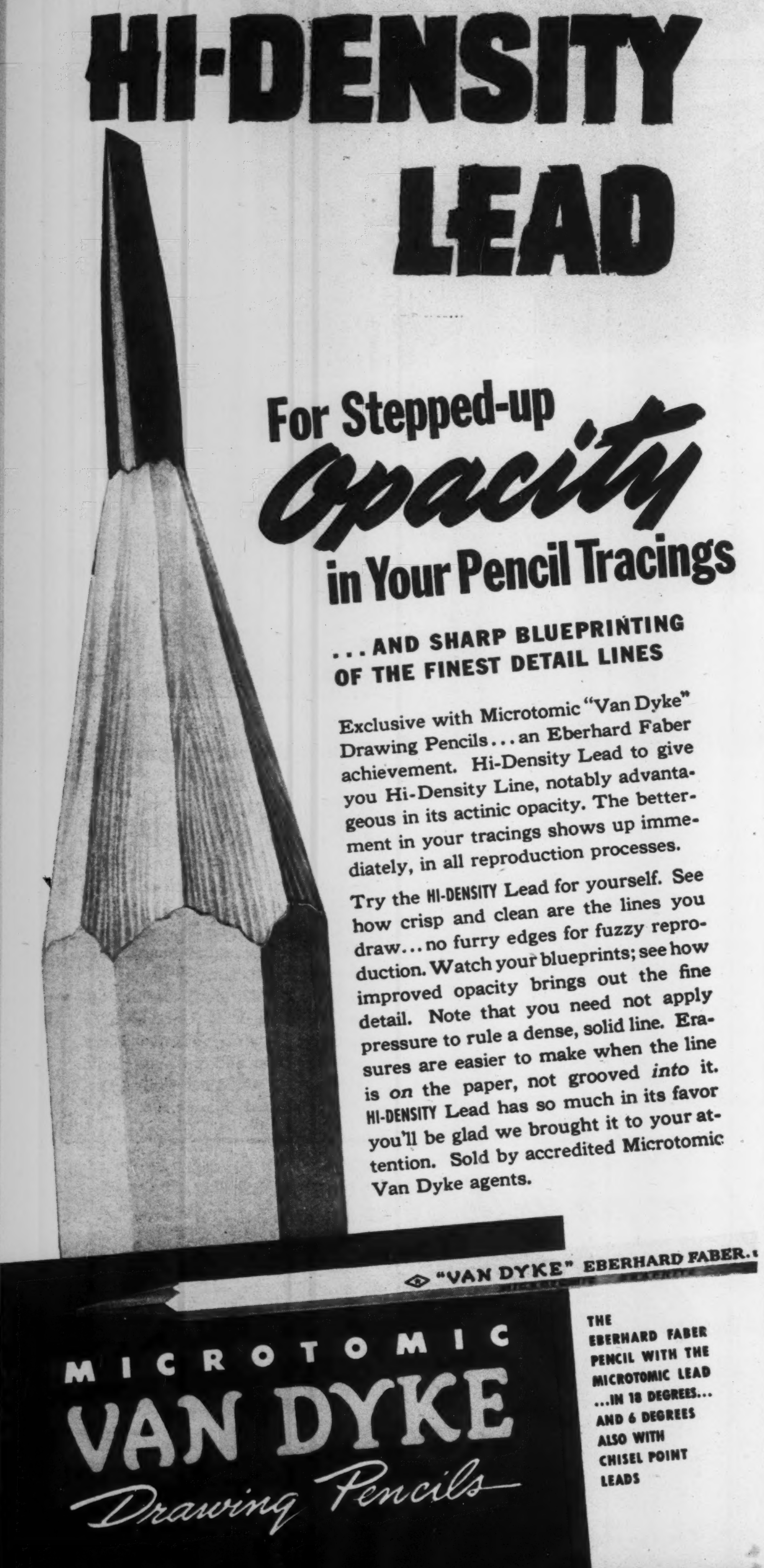
Worthington Pump and Machinery Corporation, Harrison, N. J. Holyoke Compressor and Air Tool Department, Holyoke, Massachusetts



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promoted to the position which he h
until his retirement two years ago.

Cochrane Steam Specialty Co.,
Federal St., Boston, Mass., announ
the addition of Joseph L. Dudley to th
organization. Mr. Dudley was forme
associated with Jackson and Morela
Engineers and with Stone & Webs
Engineering Corp. The Cochrane Ste
Specialty Co. represents in New En
land the Cochrane Corp., the Hays Cor
the Reliance Gauge Column Co., t
Northern Equipment Co., Roto Co., t
Wheelco Instruments Co., the Buffa
Meter Co., the American Arch Co., t
Taylor Instrument Co., the Vulcan So
Blower Corp. and the Fairfield En
neering Co.

G. G. **Greulich**, formerly sales eng
neer, is now consulting engineer of th
specialty division, sales departmen
Carnegie-Illinois Steel Corp.

Formation of a nation-wide promotion
organization by the manufacturers of pr
fabricated houses and the appointmen
of Harry H. Steidle of Washington, D. C
long identified with building standard
and building materials, as managing d
rector, indicate that the enlarged hom
manufacturing industry is preparing fo
even greater expansion. Prefabricate
Home Manufacturers' Institute is th
new trade group which represents an in
dustry that last year produced mor
than 100,000 factory-built houses to mee
war needs. It will have headquarter
in the Shoreham Building at Washing
ton, D. C.

L. C. **Allman**, vice-president of the Frue
hauf Trailer Co., has just returned fron
a four week trip through the wester
part of the United States where he ha
been making a study of highway trans
portation under wartime conditions. Hi
itinerary included Denver, Salt Lak
City, Los Angeles, Fresno, San Francisco
Portland, Seattle, Minneapolis, and St
Paul. Mr. Allman found a large amoun
of effective work being carried on by
truck operators in spite of all their diffi
culties due to shortages of equipment
manpower and repair parts.

K. C. **Gardner** has been elected presi
dent and general manager of the United
Engineering & Foundry Co., Pittsburgh
Pa. He succeeds George T. Ladd, who
died Oct. 3. F. C. Biggert of Pittsburgh
a former president who has been super
vising engineering work for the firm, was
elected to the new position of chairman
of the board. Other officers remained
unchanged except for the following:
John L. Young, former manager of ma
chinery sales, was made vice-president
in charge of industrial research; George
V. Lang, former secretary and treasurer

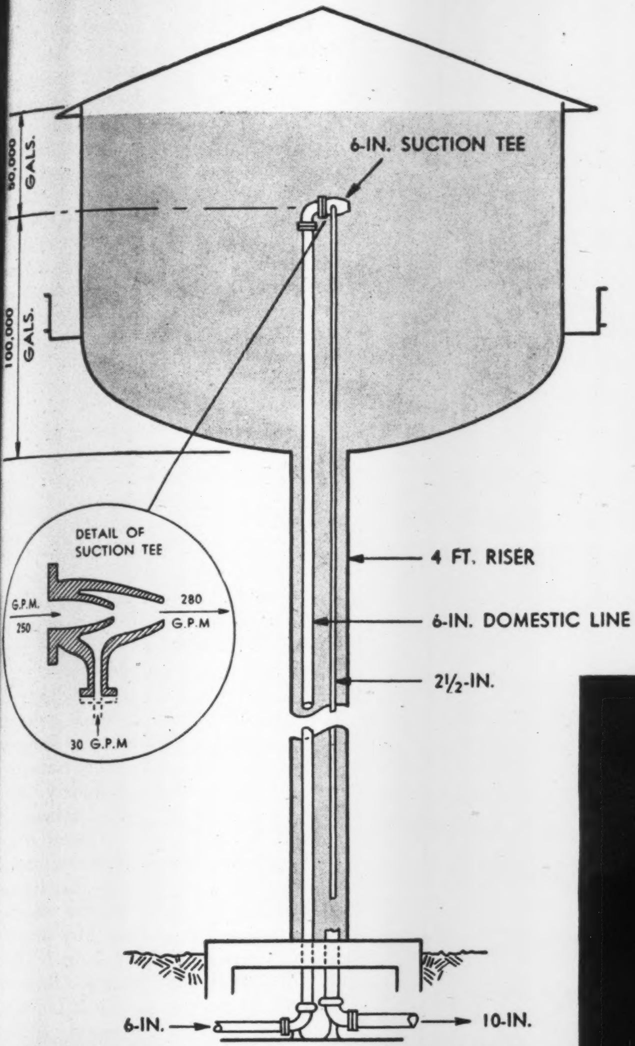


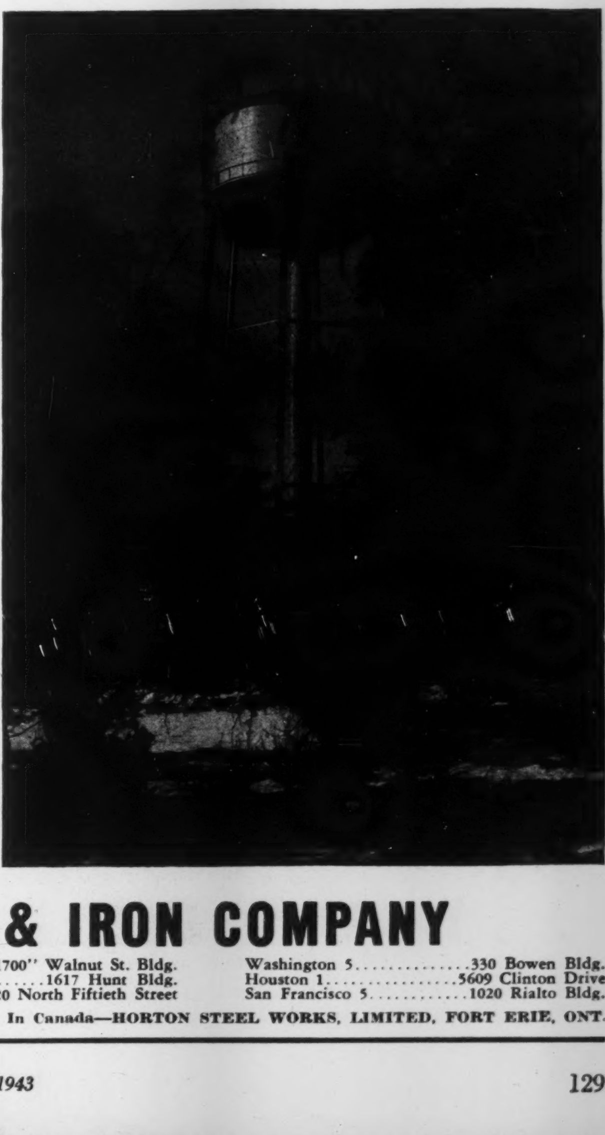
Diagram of piping arrangement in 150,000-gal. elevated water tank on A T & S F Railway at Grand Canyon.

The diagram above illustrates an interesting piping arrangement installed in the tank shown at the right to keep it from freezing. The tank is a 150,000-gal. ellipsoidal-bottom structure built for the A T & S F Railway at Grand Canyon, Ariz., in 1927. Although subject to relatively low temperatures, this arrangement has operated successfully for 16 winters.

The filling line extends through the riser and up into the body of the tank. The upper end of this filling line is equipped with a 6-in. suction tee which has a 2½-in. line extending almost to the bottom of the riser. When water is pumped in through the filling line, the suction tee causes water from the bottom of the riser to be drawn up through the 2½-in. line, thereby creating circulation in the tank that prevents freezing.

DON'T LET COLD WEATHER catch you napping . . .

Elevated tanks providing gravity water pressure for fire protection in northern climates and also municipal water tanks that are not likely to have sufficient movement of water through them to prevent ice from forming are equipped with heating systems or other devices to keep them from freezing. This year, more than ever, industrial plants and waterworks operators should be sure that such heating equipment is operating effectively. It should be checked regularly, particularly when the temperature drops rapidly and during extended cold weather.



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New York 6........3311-165 Broadway Bldg.
Cleveland 15..........2201 Guildhall Bldg.
Philadelphia 3..1623-"1700" Walnut St. Bldg.
Tulsa 3......................1617 Hunt Bldg.
Birmingham 1......1520 North Fiftieth Street
Washington 5..............330 Bowen Bldg.
Houston 1.................5609 Clinton Drive
San Francisco 5............1020 Rialto Bldg.

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AMERICA'S STANDARD FOR OVER 20 YEARS

was made treasurer, a director and me ber of the executive committee; Carl Zinsmeister became secretary; C. Rebhun, assistant secretary, and E. Ward, assistant treasurer. The compa one of the world's largest builders heavy machinery, also has plants in V dergrift, Pa., Youngstown, Ohio, a Pittsburgh, Pa.

H. G. Coffey was elected vice-pre dent of sales and production of Aetn Standard Engineering Co. at a rece directors' meeting. Coffey formerly w in charge of sales. All officers and rectors of this Youngstown, Ohio, conce were reelected at the stockholders a directors meeting.

W. C. Carter, president, Link-B Company, Chicago, has announced t following promotions: Edward J. Burne heretofore vice-president and gene manager in charge of Pershing Ro plant operations and central divisi sales, has been transferred to the exec tive office of the company, 307 N. Mic igan Ave., Chicago 1, Ill. In his n position Mr. Burnell will be vice-pre dent in charge of sales for the enti Link-Belt Company. Assisting Mr. Bu nell will be Nelson L. Davis, sales ma ager for materials handling machiner William H. Kinkead, sales manager f power transmission machinery; and Walter Spalding, sales manager f power transmission equipment requir by original equipment manufacturers a duplicate machinery accounts. Harold Hoefman, manager of the compan Atlanta plant, succeeds Mr. Burnell general manager of the Link-Belt Pers ing Road plant, Chicago. Richard Holmes, district manager at Indianapo has been appointed manager of the A lanta plant to succeed Mr. Hoefma David E. Davidson, district engineer the company's Detroit office has be named district manager at Indianapo to succeed Mr. Holmes.

Appointment of Harvey A. Craig, district sales manager of Republic Ste Corporation in the Los Angeles distri has been announced by N. J. Clark vice-president in charge of sales. Arth C. Geldner will be assistant district sal manager in that territory. For ma years Mr. Craig was vice-president Rheem Manufacturing Company, Ric mond, Calif.

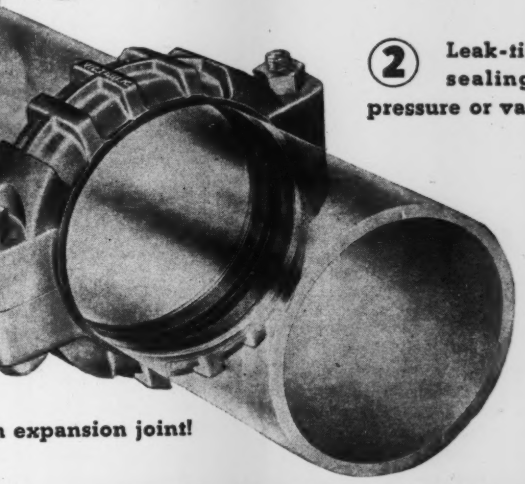
The Manufacturing Equipment Co pany, Chicago has been purchased Harry I. Schuster, western engineer f the Potter & Johnson Machine Compan Pawtucket, R. I., and will be moved 3025 W. Atkinson Ave., Milwaukee, Wis with Mr. Schuster as president; B. Schuster, vice-president; Nelson F. P trie, secretary and Clarence J. Mey treasurer.

A PIPELINE THAT WON'T STAY BOMBED OUT!

It bends with the blast of near misses as illustrated in the training picture you see here. At the battle front when sections are destroyed by direct hits or by big bombs hitting nearby, new pipe can be laid and coupled in a matter of minutes. The reason? The couplings of thousands of miles of the Blitz pipelines, that are helping make rapid troop advances possible, *are Victaulic.* Add up the 5 basic Victaulic advantages and you'll see why the Victaulic method of coupling pipe is not only faster but better at home, too.

① **Fast Self-Aligning permits angular deflection!**

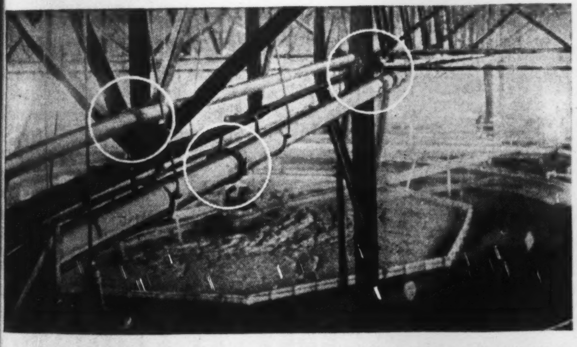
② **Leak-tight, self-sealing under pressure or vacuum!**



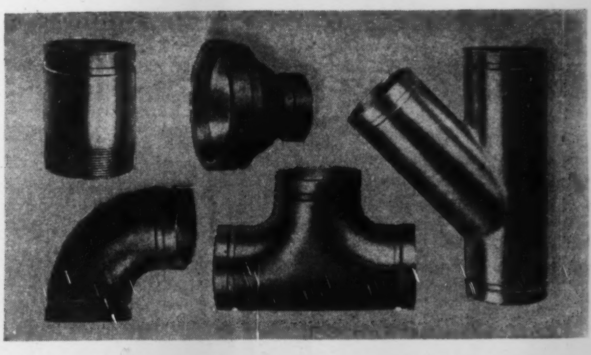
③ **Positive mechanical lock of pipe lengths!**

④ **Every joint is a pipe union!**

⑤ **Every joint an expansion joint!**



DOLLAR SAVING FEATURES FOR INDUSTRIAL CONSTRUCTION! Installed faster and with less labor than any other method. A small socket wrench is the only tool needed. Victaulic joints are compact, flexible. Provide substantial savings in space and weight. Temporary lines can be salvaged 100 per cent. Maintenance is nil on permanent jobs.



VICTAULIC FULL-FLOW FITTINGS eliminate the tedious work of ordinary pipe fitting. Long easy sweeps and smooth true-circular walls reduce friction losses. A real contribution to speed and ease of installation and greater efficiency in conducting fluids and gases in pipe systems!

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INDUSTRIAL

VICTAULIC

SELF-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

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with COST SAVINGS

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In pile driving, the first big step in construction, it is easily possible for you to begin important cost savings. Plus this, you keep your construction up to schedule as far as the pile driving is concerned. You get a faster start on the construction operations that follow. With the Super-Vulcan you get twice the blows per minute — more piles driven per dollar—less steam used. These Pile Hammers have rugged strength—are of simple design—have positive action — are easy to operate — are durable and fit the same leads and use the same accessories as the Vulcan Single-Acting Pile Hammers.

Sizes
18C—30C—50C—80C
meet all needs

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331 North Bell Avenue
Chicago illinois

NEWS OF THE WEEK

(*Continued from page 73*)

Chicago technical groups create a common council

Announcement was made Nov. 1 of the formation of the Chicago Technical Societies Council embracing some 33 engineering, technical and scientific organizations in Chicago and the nearby vicinity. There are some 12,000 engineers and technical men registered with these societies. Other groups are expected to join as the movement gets under way.

Creation of this common council fills a long-felt need for a coordinating body through which the individual societies might effect a greater unity of purpose. Birth of the idea stems from the demonstration of what can be accomplished through cooperative effort when the Chicago War Production Clinic was staged by the various engineering societies of Chicago at a meeting last spring at the request of WPB. At this meeting 2,500 engineers, executives and production men assembled to discuss practical phases of war production. Another such clinic will be held in Chicago next spring.

Principal objectives of the newly formed organization are to provide a common instrumentality through which the member groups can give greater aid in the present war effort; to cooperate in solving postwar employment plans; to develop modern engineering through increased technical and scientific studies; and to give greater cooperation in the solution of civic problems involving the construction and operation of public facilities.

Administrative officers of the Chicago Technical Societies Council, elected to serve the first year, are headed by Chairman Thomas S. McEwan, vice president of McClure, Hadden and Ortman, consultant management engineers of Chicago, and former regional director, WPB. Other officers, all of Chicago, include: vice-chairman, B. E. Schaar; corresponding secretary, K. H. Hobbie; recording secretary, P. S. Smith; and treasurer, G. P. Halliwell.

A six-man board of directors includes: F. E. Keith of the American Institute of Electrical Engineers; P. R. Elfstrom, Western Society of Engineers; B. L. Simpson, American Foundrymen's Association; L. S. McPhee, American Welding Society; R. R. Hoefer, American Society of Tool Engineers; and C. S. Becker, Industrial Management Society.

Meetings of the officers, board of directors and two delegates from each of

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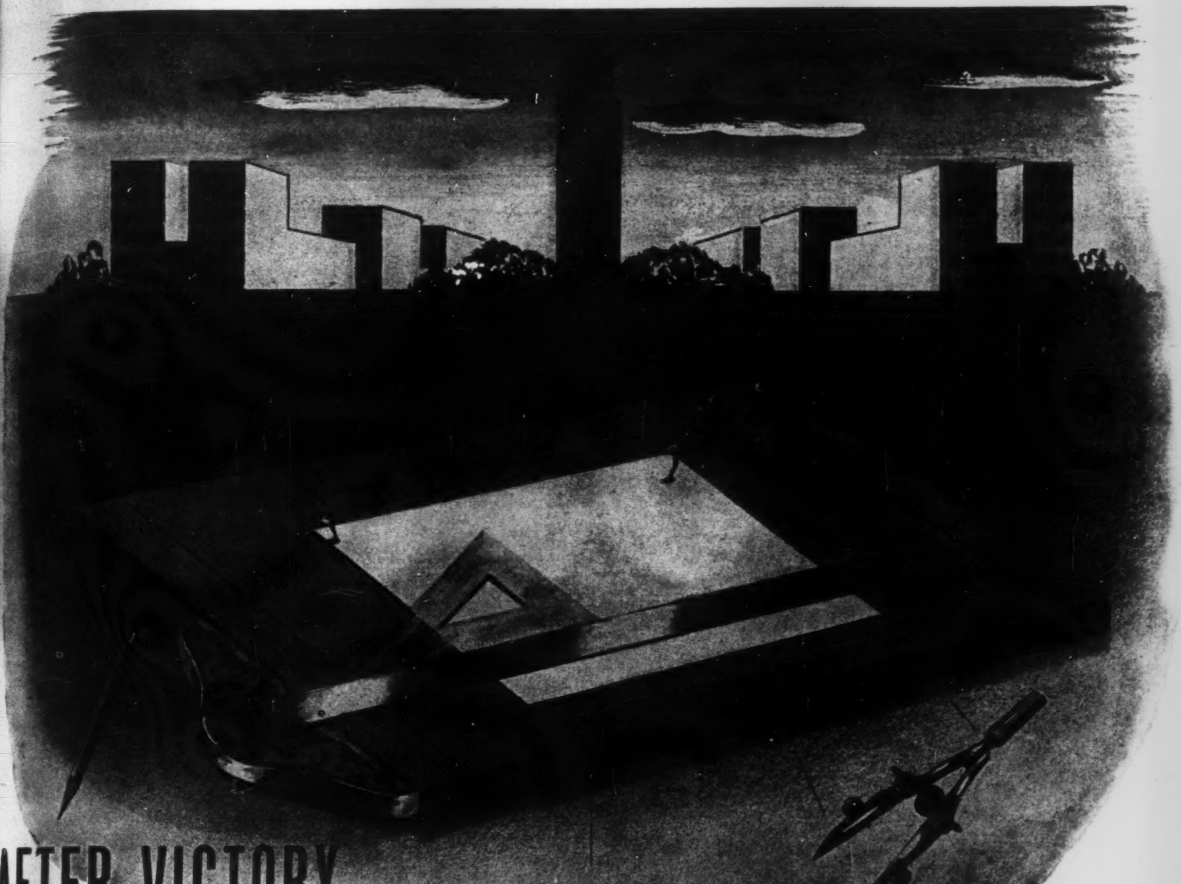

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Soon there'll be busy days ahead on the American scene with plenty of new activity and big jobs to do. Rapidly growing population, ever-expanding industries will call for constantly increasing water supply.

These are the problems we should be concerned with today . . . for the days spent in planning now may save months of delay later on. In planning the water supply lines of tomorrow, it's the duty of every responsible official to build not only the sturdiest pressure lines possible, but also pipelines whose carrying capacity will be at a maximum and will remain undiminished so as adequately to meet the ever-increasing demands of the future.

Lock Joint Pipelines have served four decades of useful service, immune to tuberculation and corrosion, maintaining their original high capacity and original strength! The extensive use of these pipelines for important mains on various types of jobs throughout the country is abundant proof of their reliability and economy. Whether your project is large or small, for the present or the future, your 'phone call, telegram, cable or letter to any of our offices will bring an immediate response.

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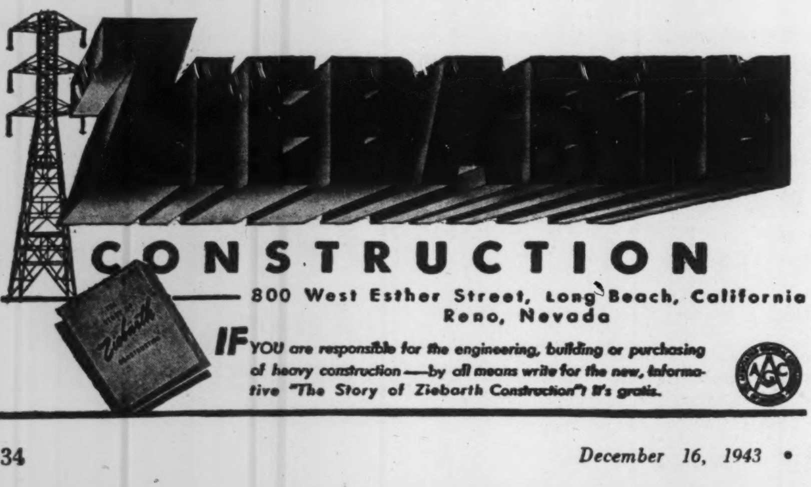
ZIEBARTH
The Story of Ziebarth Construction

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800 West Esther Street, Long Beach, California
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IF YOU are responsible for the engineering, building or purchasing of heavy construction—by all means write for the new, informative "The Story of Ziebarth Construction"! It's gratis.

the affiliated societies will be h
monthly to discuss subjects of interest
the organization as a whole.

• • •

Michigan road machinery sold to the counties

Sale of $101,900 worth of road equi
ment by the Michigan State Highw
Department to seven county road co
missions, which have taken over tru
line highway maintenance on a contra
basis, was announced recently.

In order to make sure the state w
have ample equipment if the maintenan
contracts should be cancelled for a
reason, the transactions include a pro
sion requiring county road commissio
to keep the equipment until new m
chinery is available and to resell it to t
state if their contracts are cancelled.

• • •

Resale of city water by suburb upheld by court

Terminating an unsuccessful five-ye
fight by the city of Milwaukee, Wis.,
control the resale of water supplied to
suburbs, the Wisconsin Supreme Cou
on Nov. 9, affirmed a Dane County c
cuit court decision approving an ord
of the state Public Service Commissi
authorizing West Allis to sell water
prescribed rates to the town of Gree
field, Wis.

In its appeal from the order, Milwa
kee had contended that the granting
a community the right to resell wat
supplied by the city might lead to su
an extension of service as eventually
exceed the capacity of the distributi
system.

In the county circuit court's decisio
however, the late Judge A. C. Hoppma
held that the commission's order w
reasonable and did not lead to the dang
envisaged by the city.

(*News continued on p.* 148)

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Monotubes are so strong and rigid they require no heavy core or mandrel, and can be driven with average job equipment.

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Time and Labor Savings!

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We're entering into contract negotiations now for the development of standard or special trailer units. Send your inquiry at once, that the time-consuming preliminary details can be out of the way—ready for swift completion later.

Write for our data sheet to aid your post-war planning.

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BEN-HUR INDUSTRIAL TRAILERS

MEN AND JOBS

A. E. Niederhoff, the author of " print Reading for the Shipbui Trades," who was formerly empl by the U. S. Army Engineers at land, Ore., is now a design engine the Oregon Shipbuilding Corp. in land.

Cecil C. Overstreet has been appoi city engineer and superintendent streets of Phoenix, Ariz., to succeed Quigley, who resigned.

Dewey Harchley has been placed charge of the Tonkawa, Okla., sub- for the U. S. Engineers. The area has been moved to Enid, Okla.

George Neal Bradshaw, junior resi engineer of the Tennessee Highway partment, has been placed in charg the office and construction of the Sh County branch of the highway dep ment.

H. Herrera has been appointed dire of the National Public Works offic Guarico State, Venezuela.

First Lt. Edwin A. Mawhinney, assis post engineer at the Charlotte, N. Army Quartermaster Depot, has lef attend the company officers course Fort Belvoir, Va.

Hey D. Westberry, of Georgetown, previously connected with Army construction engineers working on tary installations, has been assigned Camp Butner, N. C., as accident pre tion engineer. He succeeds **Edward Higgins,** who resigned recently to bec a petty officer second class in the Na Seabees.

William T. Ingram, assistant regio sanitary engineer in Region IX,

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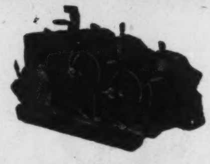
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Built to set the pace

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After more than a decade of duty in all types of construction equipment on the kind of jobs that really put power "through the wringer"—this fact about Cummins Dependable Diesels stands out like an unbroken window in Berlin: They are built to set the pace in dependability, economy and speed —*and hold it!* Day and night . . . until the job is wrapped up and delivered.

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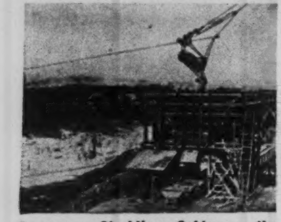

Sauerman Slackline Cableway digs sticky matrix from deep deposit and delivers 70 cu. yd. per hour to car-loading hopper.

Sauerman Tower Machine digs a waste disposal basin 400′ wide, 1500 ft. long, on sloping ground; piles the spoil to make a dam at toe of slope.

Where materials are to be moved distances of several hundred feet or more, a SAUERMAN Drag Scraper or Cableway can cut the cost per cubic yard to a low figure because it is able to dig, haul and place the material in a continuous, straightline operation, doing away with the expense of rehandling. The operation is smooth and rapid, producing large yardage with moderate expenditure of power.

The first cost of a SAUERMAN Machine is reasonable, maintenance amounts to very little, and the simplicity of operation makes it possible to place the control of even the largest installation in the hands of one operator. Moreover, the machine is very flexible, hence it is easy to adapt it to the exact needs of different jobs.

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Typical examples of pit and bank excavation, reservoir cleaning, moving blasted ore, deep dredging, stockpiling and reclaiming, etc., are illustrated in the Sauerman catalog. A copy of this booklet is yours for the asking.

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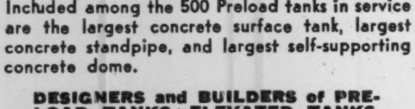

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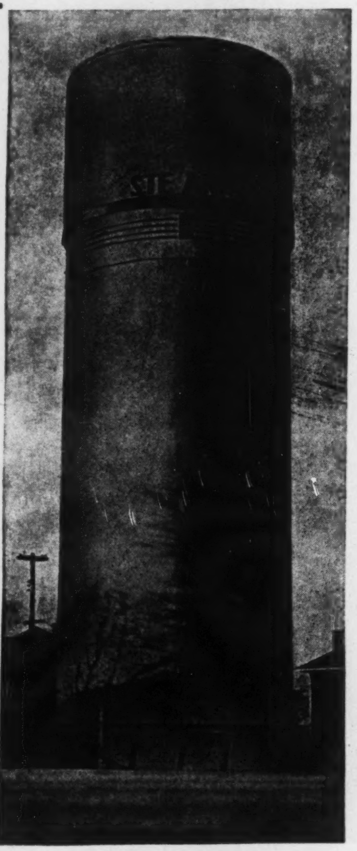


headquarters in San Francisco, has promoted to the position of regional tary engineer to succeed Gerald E. A who has been assigned to the San cisco district of the War Produ Board. Mr. Ingram, a graduate of ford University, in civil engine joined the medical division in 1942 had previously spent several year office engineer with the Pacific G Electric Co., San Francisco, and was sanitary engineer of the San Joa local health district, Stockton.

John C. Luthin, recently office eng at the Richmond, Calif., shipyards o Kaiser Co., has been commissione the U. S. Public Health Service Re and assigned to Region IX as assi regional sanitary engineer to suc William T. Ingram. Prior to his ass tion with the Kaiser Company, Mr. L held various engineering position California.

Jack H. Ellis of Wilmington, N. C. been commissioned a second lieute in the Army Air Forces. Prior to e ing the service, he was employed b engineering division at Camp D N. C. He is a graduate of the N Carolina State College Enginee School.

Eugene S. Sweeney, who was in the ploy of Borchert-Ingersoll, Inc., at Paul, Minn., for years, entered the ice a year ago. He has just been moted to captain in the 1195th Engi Base Depot Group. Captain Sweeney recently transferred from Camp borne, La., to Granite City, Ill.

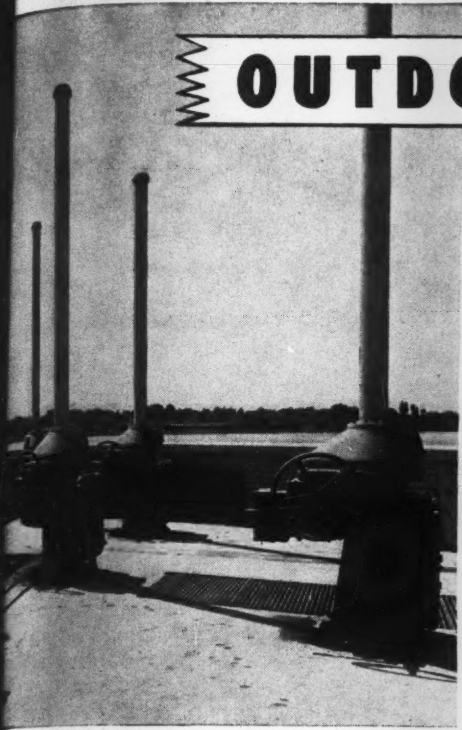
James R. Nevin has been appointed engineer at Ottumwa, Ia., to serve such time as Henry E. Cook, former engineer, can obtain his release from work at the naval air station. Mr. N was formerly county engineer for Je son county.

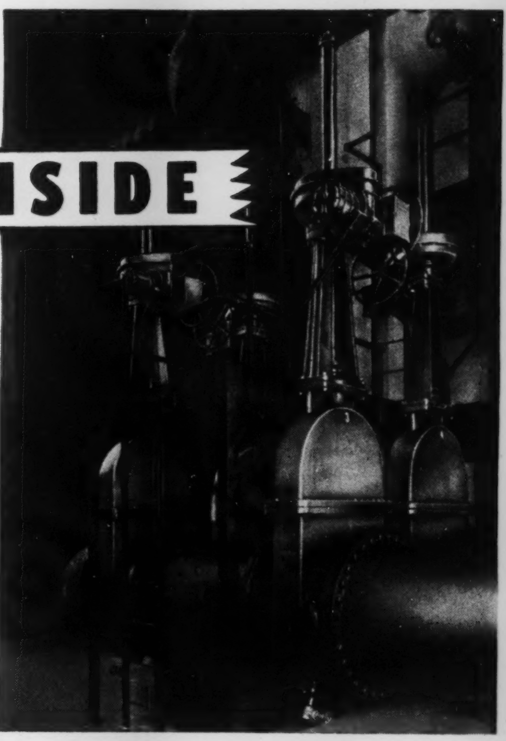
Macon M. Williams, city engineer superintendent of waterworks of Le N. C., has resigned, effective Dec. enter private employment. Carroll Rabb has been appointed general ager of the town to succeed him.

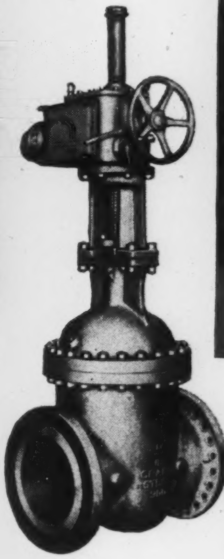
Harold J. Dillehay, executive directo the Charlotte, N. C., Housing Autho since its organization in March, 1939, been granted a leave of absence for year to accept a position of a confiden nature in Tennessee. He is a nativ Southern Pines, N. C., and was a gen contractor at Fayetteville, N. C., be going to Charlotte to supervise the p ning and construction of housing p ects. He later became director of the thority set up to manage the projects

OUTDOORS

OR INSIDE







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Water shut-offs mean Industrial shut-downs, and this in turn impedes the war effort. A valve insertion job does not necessarily mean that you have to shut down service. With a Smith Valve Inserting Machine you can insert valves with the service at full pressure. These machines are made in 6 sizes for inserting 4" to 36" valves, are simple and easy to operate and do a surprisingly quick, clean job.

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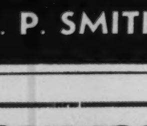
Heat Treating Furnace—In industria postwar planning much is being sai about metals, materials, machines an methods. One production machine, havin much to do with each of these, is th heat treating furnace. A booklet has bee produced for those who have only re cently experienced the need for hea treating, and for those who have the jo of converting war production lines t peace products. To the first group thi booklet is a bit of industrial furnac background, and to the latter it is th answer to the problem of tomorrow' heat treating furnace.—*Surface Combustion, Toledo, Ohio.*

Pressure-treated Lumber—A 26-pag guide for engineers in selecting pressure treated lumber in construction, just published, illustrates installations in genera construction, farm buildings, highway and railroads. A special section explain pressure treatment of wood against decay, fire, acid and termites.—*Kopper Co., Wood Preserving Division, Pittsburgh, Pa.*

Engineering Manual—A new illustrated engineering manual of 36 pages o stainless steel flexible tubing and bellow contains much engineering data and specifications not heretofore published. Characteristics of the product are shown i detail, with tables of sizes, weights, wal thicknesses of the various wall forms, together with pressure data, minimum bending radii and other detail useful to th engineer. Complete data on fittings is also

Hayward Buckets



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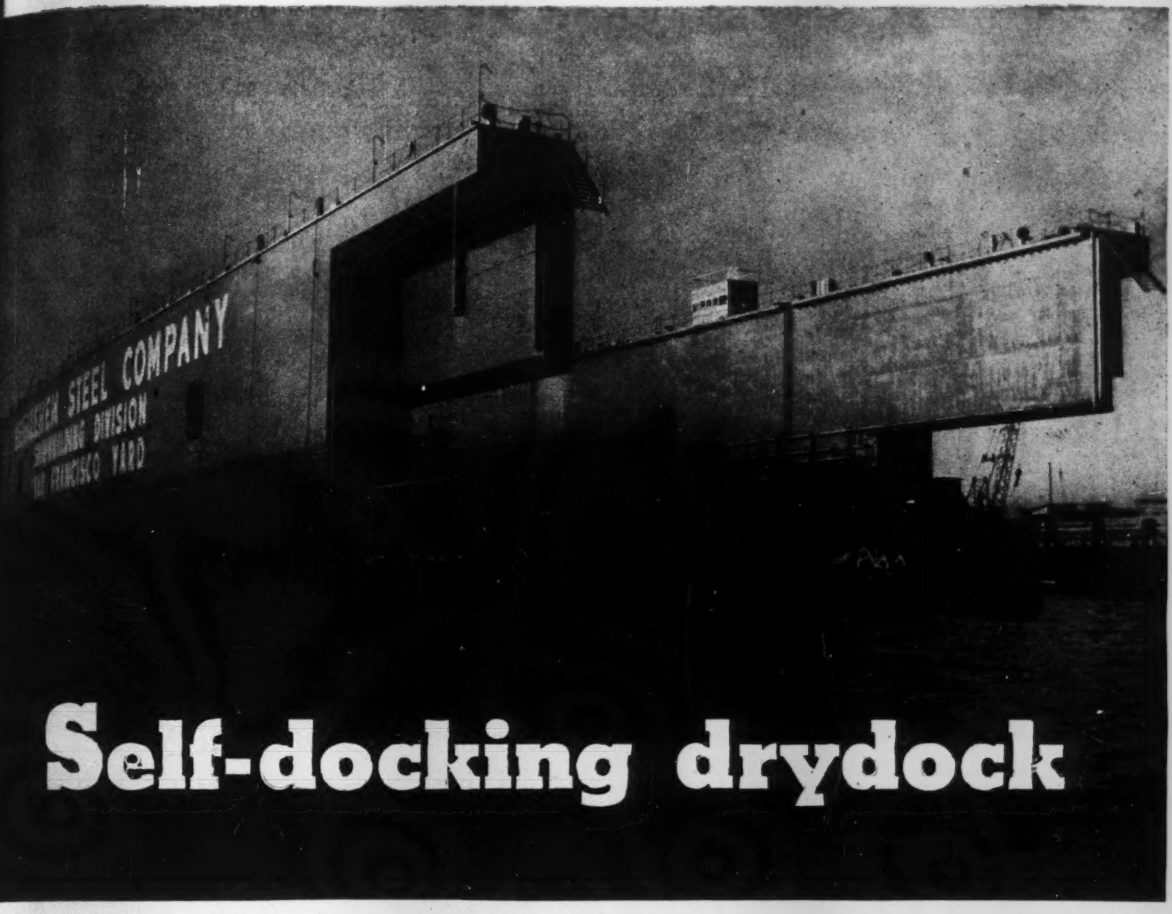
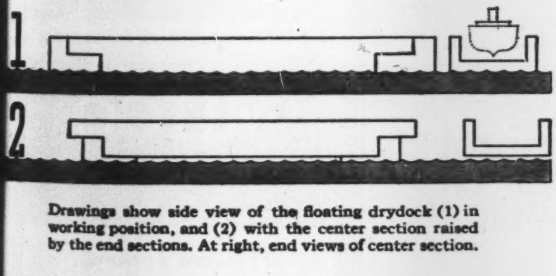


Self-docking drydock

he steel structure shown above at its erection site t Alameda, Calif., is a floating drydock which, like ome huge porpoise, can lift itself clear of the water. The drydock was fabricated and erected, and is wned, by Bethlehem Steel Company to service ships n the Pacific trade. It is capable of berthing the largst commercial vessels now plying the Pacific.

elf-Docking Features



Drawings show side view of the floating drydock (1) in working position, and (2) with the center section raised by the end sections. At right, end views of center section.

Designed by Rear Admiral (ret.) Frederic R. Harris, ho has patented many of its features, the drydock in three sections. The center section is designed to e raised out of the water for the purposes of removing arnacles. For this operation, the two movable end ections of the drydock are partially submerged, and moved under the center section, forming shelves on which it rests before raising. In similar manner, the end sections may be brought to rest on the center section, and then raised clear of the water. Thus the drydock is wholly "self-docking."

Launching—Local conditions suggested a method of launching which is believed to be unique. Instead of launching on shipways or in an artificial basin, it was decided to lower it into the water on sand jacks. Accordingly, falsework for construction was supported above the water on 20 jacking towers—clusters of four 28-in. jacks, 12 ft., 6 in. high. The launching date was chosen with regard to tide conditions, and the drydock, drawing 5 ft., 6 in., was lowered 9 ft., finally floating in 7 ft., 9 in. of water at high tide.

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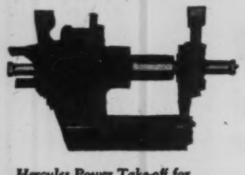
FIRE!
SURE!
WIDE WORLD PHOTO

BUT IN 60 SECONDS IT'LL BE OUT!

On the job – night and day – are the new Army Crash Trucks, with their asbestos-suited crews.

HERCULES SPLIT-SHAFT POWER TAKE-OFFS, inserted in the drive-shafts of these radically new fire-fighting units, transmit to the pumps the power of the truck motor. The result is a stream with three times the force ordinarily used, and the high-pressure fog thus distributed through the turret guns simply blasts away the flames and smoke.

We're glad that other Hercules products are doing their bit in destroying the enemy, but we're proud to have a part in building a unit which will save the lives of our own men.


Hercules Power Take-off for Truck-mounted Equipment

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BUILDERS OF HERCULES HYDRAULIC HOISTS AND DUMP BODIES
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given, with diagrams and instructions for attaching fittings, and recommended design procedure for various types of applications.—*Chicago Metal Hose Corporation, Maywood, Ill.*

Clamshell Buckets—"Maintenance and Care of Clamshell Buckets" is the title of a 20-page booklet in color. Now that it is difficult to buy new buckets, the maintenance problem is of first importance, and this booklet, liberally illustrated with photographs and diagrams of parts and assemblies, should prove especially timely.—*Blaw-Knox Company, Pittsburgh, Pa.*

Gages and Tools—A visual presentation of its spheres of service to American industry in unique portfolio form, has recently been prepared for executives in metal working and manufacturing industries by this manufacturer of gages and tools. One division is devoted to the manufacture of standard, plain and threaded, plug and ring gages for accelerating the mass-production of interchangeable parts of all types.—*Merz Engineering Co., Indianapolis, Ind.*

Welding in Shipbuilding—With graphic presentation in word and picture, the fall issue of SPARKS tells the story of welding in the shipbuilding industry. It carries a double-page spread showing how welding was recently employed to graft a new bow on the torpedoed destroyer Blakely and put her quickly back into service. An item worthy of addition to anybody's collection of ship pictures is a full page of silhouettes of 24 of the types of ships which comprise Uncle Sam's maritime strength.—*Tube Turns, Inc., Louisville, Ky.*

Stainless Steel—Included in a catalog of stainless steel is information on analyses, applications, manufacture, fabrication, and standard size of sheets and plates. It also explains the "assembly method" used in making this product. Of special interest to fabricators planning to use this composite metal are the sec-

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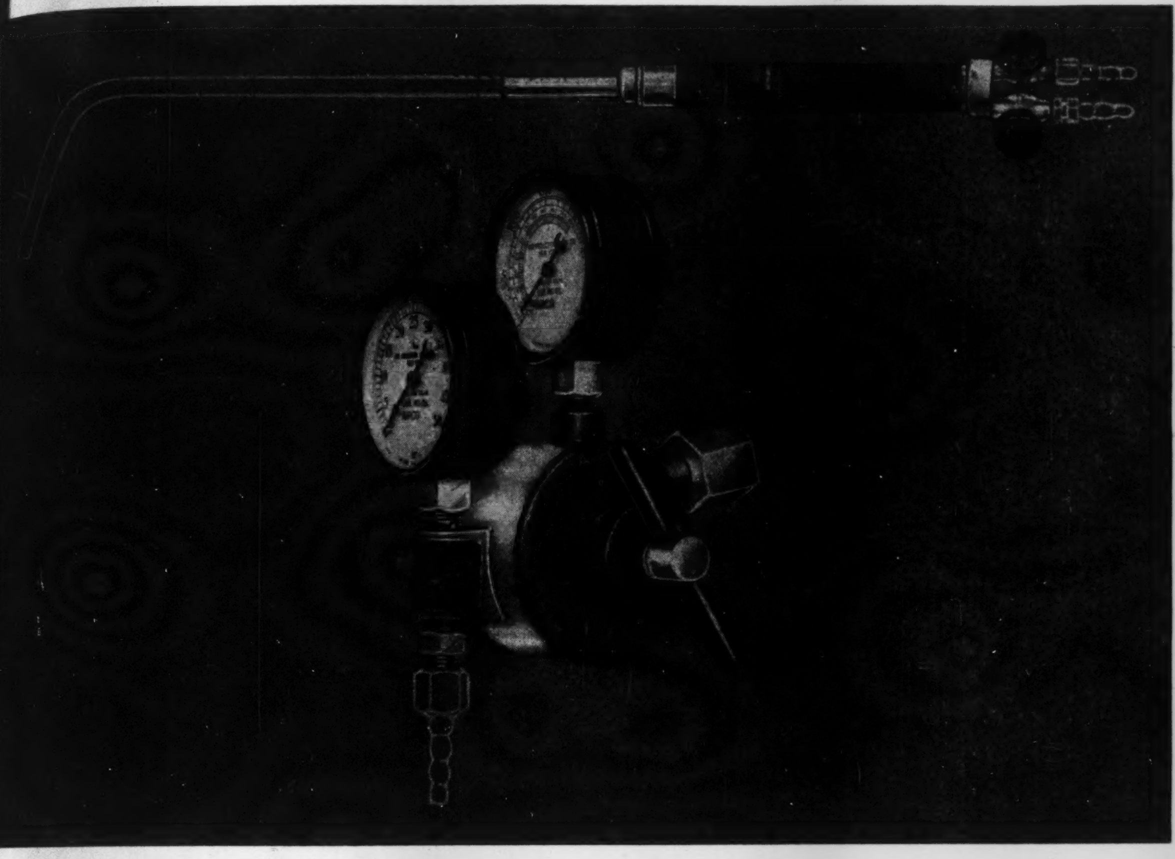

. . . BUT *None in Performance*

To conserve copper, copper base alloys and stainless steel, some component parts of Airco torches and regulators are now made of less critical materials. The dark areas in the above illustration indicate the parts affected by this change. All these parts are treated with a special coating for maximum protection against corrosion.

In all other respects, Airco torches and regulators are unchanged.

The parts shown in white outline above will no longer be furnished automatically with torches or regulators. This also is done for the purpose of conserving critical materials.

Purchasers desiring hose connections should therefore be sure to include them specifically when ordering torches or regulators. The same should be done with tips when ordering torches—in this case mentioning the size or sizes of the tips required for current operations.

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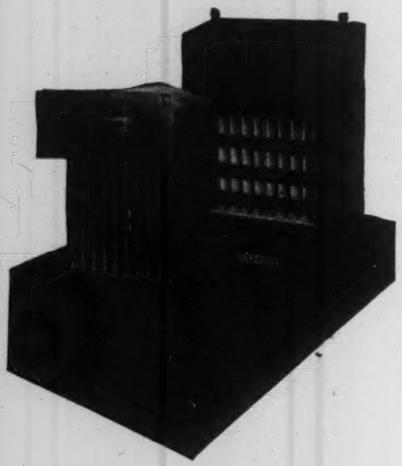
PUTTING MORE B. T. U.'s TO WORK WITH—

REZNOR UNIT HEATERS



Reznor heat exchanger assembly permits wider distribution of warm air.

● Combustion liberates a certain number of B. T. U.'s, but efficiency of any heating unit is measured by the quantity of B.T.U.'s actually delivered as heat.

The Reznor Unit Heater delivers a maximum volume because the heat exchanger section is designed to permit the air to move quickly and efficiently over the heat exchanger tubes. There are no fins or projections to hold back the steady flow of hard-working B. T. U.'s. The compact, self-contained Reznor Heater is easily installed . . . can be relocated without difficulty. Printed data available upon request.

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"GAS HEATERS EXCLUSIVELY SINCE 1888"

tions on deep drawing, grinding, polishing, cleaning, gas-cutting, riveting, soldering, welding, etc.—*Jessop Steel Co., Washington, Pa.*

Industrial Salvage—A new W. P. B. book, entitled "Salvage Manual for Industry," contains 245 pages of systematically organized and classified information and data on industrial salvage practice. Material is presented in 26 chapters, grouped into 6 major sections. There are 2 chapters on organizing and planning the salvage department; 3 on the administrative factors; 12 on methods of handling (finding, identifying, segregating, collecting, reclaiming, storing, selling, etc.) metal scrap; 3 on non-metallic waste; 7 case histories demonstrating exemplary practice; a 17-page compilation of practical hints for handling specific waste materials; and a 9-page index. The book costs 50 cents a copy.—*Superintendent of Documents Government Printing Office, Washington, D. C.*

Rubber Pouring Buckets—A new catalog on rubber pouring buckets, for the safe and economical handling of acids, corrosives, and liquid high explosives has been issued. The publication also describes rubber dippers, hard rubber funnels, and rubber gloves.—*The B. F. Goodrich Company, Akron, Ohio.*

Engineered Prefabrication—A handsome illustrated booklet entitled "Engineered Prefabrication" has been issued to explain the application of the prefabrication technique to homes and housing projects, industrial and farm buildings, timber trusses, laminated arches, wooden boats and barges, shipping boxes and crates. Some of the points claimed are that prefabrication lowers costs, makes quality uniform, and permits individuality in design.—*City Lumber Co., 75 Third St., Bridgeport 1, Conn.*

Industrial Safety and Health—A new 8-page bulletin describes in detail equipment suggested as meeting U. S. Navy-U. S. Maritime Commission requirements for safety and industrial health in contract shipyards. The bulletin is indexed so that it may be used in conjunction with the U. S. Navy-U. S. Maritime Commission. Bulletin No. 511314-43-1, "Minimum Requirements for Safety and Industrial Health in Contract Shipyards."

The bulletin covers all phases of shipyard hazards and protective equipment, including safety hats, head and face protection for welders, eye protection, protective clothing, respiratory protection, fresh air supply, ventilation, protective skin creams, heat cramp preventives. It includes material on bulletin boards.

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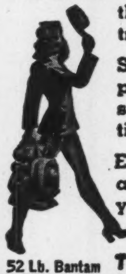

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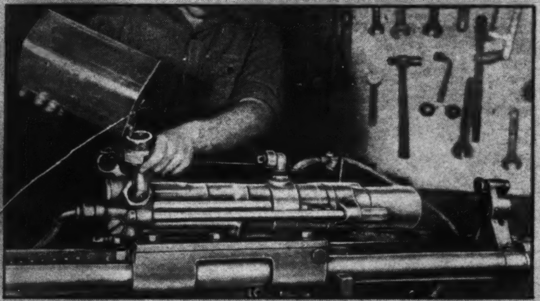
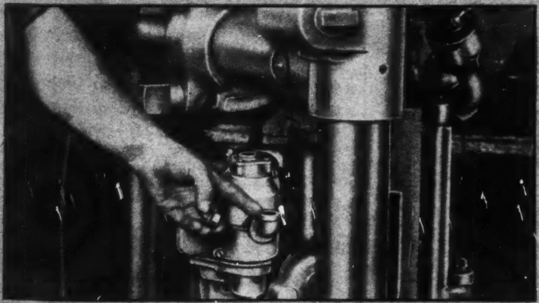
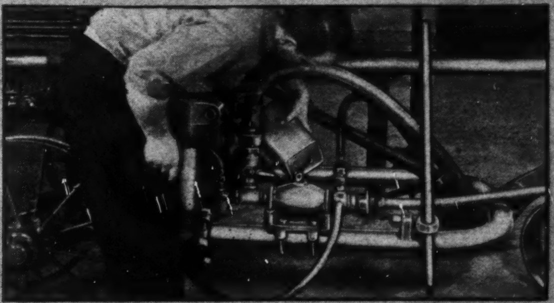


1 Put about four ounces of fairly heavy oil in the gooseneck and blow through before starting work.

2 Fill rock drill oil reservoir with half a pint of right grade of rock drill oil before every shift.



3 Check gear case frequently, keep filled to plug level. Should have regular attention once a week.



4 Always fill the line oiler twice each day when wagon drill is in operation. Capacity, one pint.

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"THE HAND OF THE SPECIALIST"

The Hand of the Specialist is Prepared for the
1944 Conversion to Synthetics

ARMY E NAVY

As the year comes to a close, Continental chemists are busy converting compounds from crude rubber to synthetics in accordance with Government regulations. This task is less difficult for Continental because it worked with synthetics for many years before the war and is well prepared to meet the situation by actual experience with all types of synthetics.

The diminishing supply of crude has made further curtailment obligatory and it is now clear that little or no crude will be available in the year ahead. But despite that fact, Continental's high standard of quality will be maintained at any cost. As a result of the industry's conversion from crude to synthetics, such a wealth of experience will be gained that the products of tomorrow will be destined to perform duties and render service beyond anything previously conceived in industrial rubber goods.

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line for forty years

Copies of the M. S. A. Equipment Bulletin G-6 may be obtained on request.—*Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.*

Lift Trucks—An aid to both new and experienced lift truck operators is a guide booklet which interprets for industrial truck operators the importance of the materials handling function and emphasizes the increasing variety of tasks that are being given lift trucks in present day handling systems. Special attention is given to fast, efficient maneuvering as well as safe and time saving operating methods.

Other sections of the 24-page booklet illustrate typical load-carrying devices and methods of stacking. Safe, space-saving methods of building unit loads are clearly shown in pictorial form. There is also a check list of "Do's and Don'ts" for safety, as well as one covering operating care.

Instructions are given for starting, shifting gears, steering, lifting and tilting. Charts give a visual picture of the control for each operation.—*Towmotor Corporation 1226 E. 152nd St., Cleveland 10, Ohio.*

Philadelphia Water System—A bulletin, "De Laval Pumping Units at Philadelphia," traces notable developments in the history of one of America's oldest and largest water systems. In the year 1801 the City of Philadelphia installed its first engine-driven pumping unit. In 1907, Philadelphia was one of the first American municipalities to use centrifugal pumps for water works service, a 2½-m. g. d., 213-ft. head turbine-driven pump having been installed at the Torresdale Station. The very latest pumps ordered by Philadelphia, four 40-m. g. d. units, were built and ready for installation when diverted by order of the W. P. B. to meet urgent requirements of Detroit, Mich., to which they have been leased by Philadelphia. The bulletin also includes interesting information concerning the effect of wear on pump efficiency.—*De Laval Steam Turbine Co., Trenton 2, N. J.*

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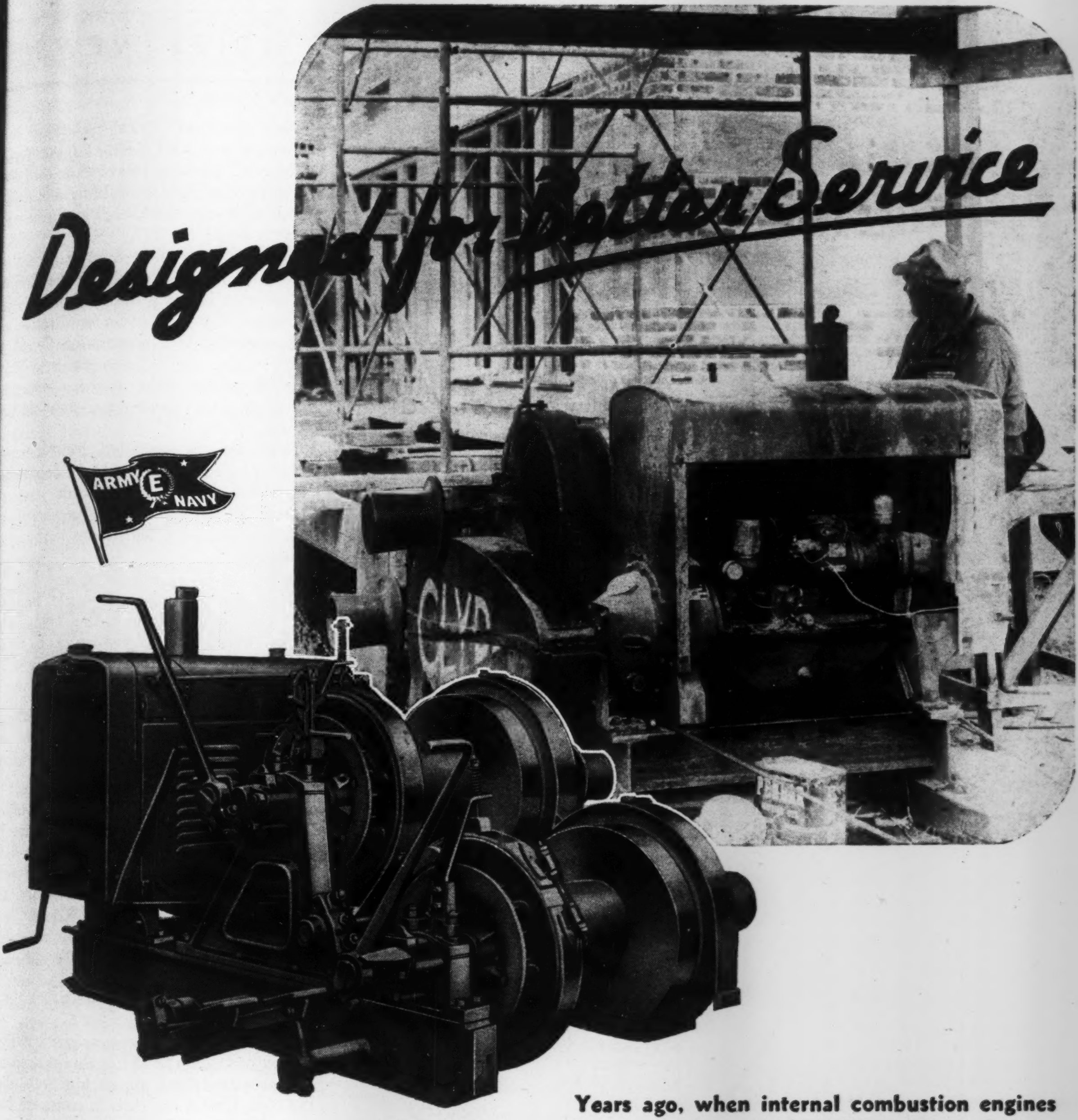

Write for Bulletin K-4 for complete information on Clyde Gasoline Hoists.

Years ago, when internal combustion engines first came into their own for industrial duty, Clyde proved that better hoisting equipment meant lower operating costs and increased construction schedules.

Now, when the pressure of the present emergency is putting more demands upon equipment than ever before, it is the hoist that was designed for better performance that's standing the strain.

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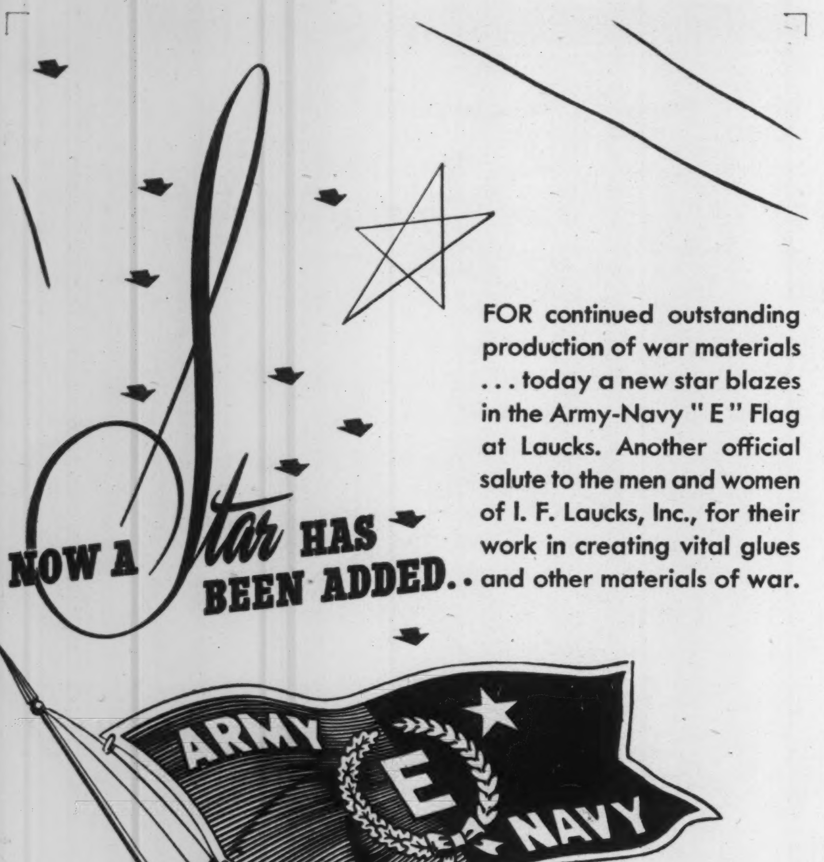
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BRIEF NEWS

Both Governor Coke Stevenson and Chairman Beauford Jester of the Texas Railroad Commission have expressed disapproval of plans for building additional pipelines to export natural gas from that state.

The Governor said that a study of underground gas supplies in the Corpus Christi area is being undertaken because of federal approval of an application by Tennessee Gas & Transmission Co. for a 1,228-mi. line from that section to West Virginia, and that he opposes exporting gas which may be needed there in the future.

This view is seconded by Chairman Jester, who said the Railroad Commission has authority only to prohibit waste of natural resources but is powerless to interfere with any legitimate withdrawal for export.

It is said that backers of any line for piping gas from Texas would have to face the possibility that the Legislature might impose a severance tax which would make it unprofitable. Lines already operate from the Texas Panhandle to the Great Lakes area and into states adjoining Texas.

C. J. Mackenzie, acting president of the National Research Council of Canada, has been honored by the Engineering Institute by being awarded the Sir John Kennedy Medal for distinguished services to the engineering profession. The award was announced by K. M. Cameron, president of the Institute, while visiting Saskatoon, Sask., Dr. Mackenzie's home city.

State Highway Commissioner William J. Cox of Connecticut has announced that the proposed new super highway along the New Haven railroad in southern Fairfield County will be an all vehicle road. The proposed highway is estimated to

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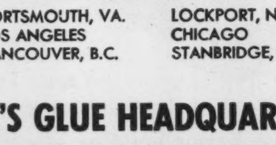
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cost $1,000,000 a mile and would run from New York State line to New Haven, Conn., about 50 miles. The Merritt Parkway, paralleling the route, is 38 miles long and was built at a cost of $21,000,000. Many bridges will be required along the new highway. Property costs along the Post Road and railroad are much higher than along the right of way of the Merritt Parkway. Difficulty will be encountered in building the road through congested areas, but the highway will be planned with a minimum of curves, grades and cross traffic.

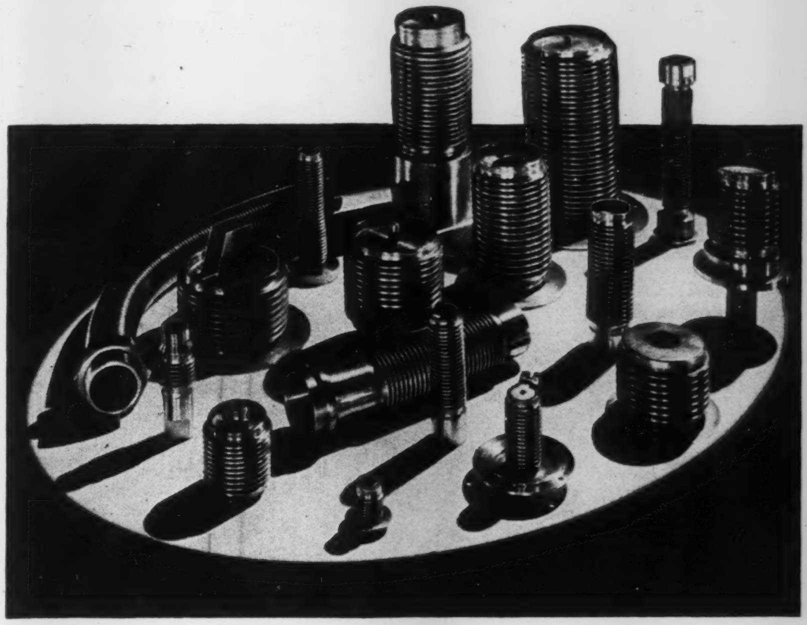
City commissioners of Miami, Fla., have authorized City Engineer C. S. Nichols by a 4 to 1 vote to spend up to $50,000 in making ocean soundings and drafting plans for Miami's proposed $12,000,000 Gulf Stream sewage disposal project.

In replying to criticisms from taxpayers on the condition of the sidewalks of Halifax, N. S., members of the city council said tenders had been called for repairing old sidewalks and constructing new ones, but not one bid was received. The contractors contended they could not find labor for the work and hence it was useless to submit tenders. The council has asked the taxpayers to provide the labor for repairing and building sidewalks and roadways.

Thomas H. Macdonald, commissioner of public roads since 1919, has been elected to honorary membership in the American Society of Civil Engineers. Mr. Macdonald has previously won recognition from three foreign countries—France, Norway, and Czechoslovakia—and from his alma mater, the Iowa State College of Agriculture and Mechanic Arts, Ames, Ia. The college presented him with the Marston Medal for achievement in engineering, in 1939, and awarded him the honorary degree of Doctor of Engineering in 1929.

Surveys and plans for establishing building lines on the White Oak and Buffalo Bayous at Houston, Tex., will be paid for by $20,000 of Houston flood control bonds, as authorized by a vote of the City Council, Oct. 6 last. The survey is necessary for the work, recommended to the War Department by the Army Engineer Corps, to prevent structures being erected upon the bayou floodways.

The Ohio River span at Paducah will be named the Irvin Cobb Bridge in honor of Kentucky's famous humorist, whose old home is in Paducah. The structure, bought eight years ago for $800,000, is due to be made tollfree soon, Governor Johnson said in announcing the name. Alabama's last toll bridge was freed



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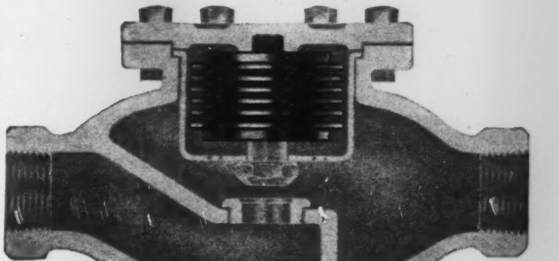

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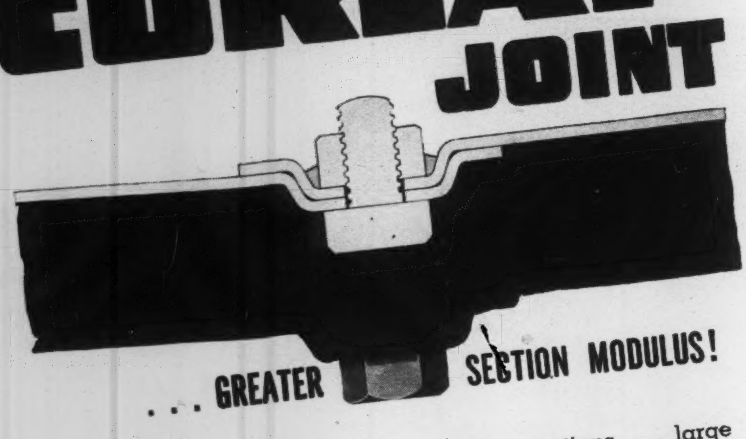

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Nov. 1. Governor Chauncey Sparks approved an agreement by which the state made a grant of $40,000 to Baldwin County to assist in paying its share of the cost of making Lillian Bridge free of tolls. The structure spans Perdido Bay, the boundary between Florida and Alabama, on the highway between Pensacola, Fla., and Foley, Ala. Escambia County, Fla., has already put up $13,000, and Alabama's action assures enough funds to retire the indebtedness of $86,000 against the bridge.

P. S. Luttrell, state production manager of the Federal Housing Administration at Fort Worth, Tex., told the Texas Statistical Council recently that it has been estimated that 1,000,000 to 4,000,000 new houses will be needed yearly in the United States for 10 years after the war. Luttrell predicted plastic plumbing piping, glass, stainless steel, plastics and laminated paints would be widely used in such houses.

Texas has prepared plans and specifications so that it can let contracts for $26,000,000 worth of road building immediately after the war. The state's entire post-war road building program calls for the expenditure of $100,000,000.

Rice crops worth $2,500,000 on 75,000 acres in the Yaqui Valley, Sonora state, Mexico, were saved by the great dam at La Angostura on the Yaqui River which the Mexican government put into service last year, according to the Ministry of Agriculture. La Angostura is one of four big dams the government has established in the northern part of Mexico. It was able to provide ample water last summer during the worst drought in 30 years in the Yaqui region.

Houston, Tex., has employed an expediter for the programs of the water and public works departments. He will make weekly reports of progress for all construction work. He is Walter W. Lynch, former expediter for J. G. White Engineering Company.

The Sacramento district office has consisted of the greater portion of California, Nevada, and part of Oregon. District Engineer Hunter announced that an area office will be maintained in Salt Lake City. Some of the Salt Lake district personnel will be absorbed by the Sacramento and San Francisco district headquarters.

Bombed cities of Great Britain have engaged outstanding architects and engineers to handle the work of reconstruction after the war. For example, the Hull City Council has made an agreement with Sir Edwin Lutyens and Professor Abercrombie for a $100,000,000 replanning and rebuilding of the city.

MEETINGS

The Associated Equipment Distributors, international association of construction machinery dealers, will hold its twenty-fifth annual meeting at the Edgewater Beach Hotel, Chicago, Ill., Jan. 17-20.

American Society of Civil Engineers, annual meeting, 33 West 39th St., New York, N. Y., Jan. 19-21.

American Road Builders' Association, 41st annual convention, Edgewater-Beach Hotel, Chicago, Ill., Feb. 1-3.

Regional and Local Meetings

Highway Engineering Conference, University of Colorado, Boulder, Jan. 7.

Colorado Society of Engineers, 28th annual convention, Shirley-Savoy Hotel, Denver, Colo., Jan. 7-8.

Oklahoma Society of Professional Engineers, 9th annual meeting, Mayo Hotel, Tulsa, Okla., Jan. 14-15.

Texas Water Works and Sewage Short School, 26th annual meeting, Texas A. & M. College, College Station, Tex., Jan. 31-Feb. 2.

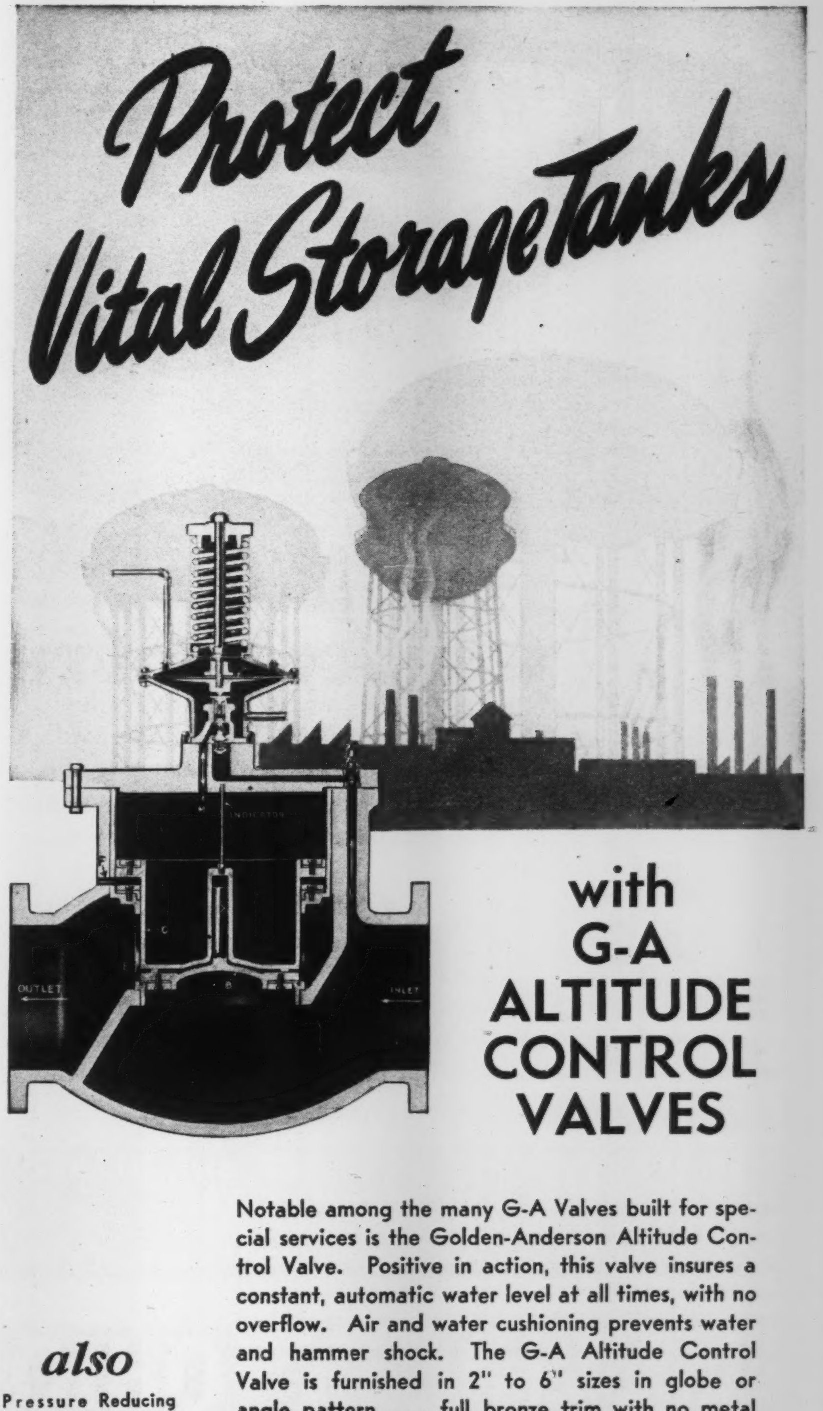
Wisconsin County Highway Commissioners Association, annual road school, Schroeder Hotel, Milwaukee, Wis., Jan. 25-27.

N. Y. State County Highway Superintendents Association, Albany, N. Y., Jan. 27-28.

Constructors Association of Western Pennsylvania, annual meeting and dinner. Hotel William Penn, Pittsburgh, Pa., Feb. 1.

Southeastern Association of State Highway Officials, annual meeting, Hotel Roanoke, Roanoke, Va., Feb. 9-10, 1944.

Michigan Highway Engineering Conference, 30th annual meeting, Grand Rapids, Mich., Feb. 8-March 1, 1944.



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Elections and Activities

Northwest Regional Housing Conference, National Association of Housing Officials. Elwood Caples, of Vancouver, Wash., was elected vice president and W. F. Haberlach, of Clackamas County, Ore., executive-committeeman.

J. B. Lambeth, of High Point, N. C., senior in civil engineering at North Carolina State College, Raleigh, N. C., has been named president of the Engineers Council, student governing body of the school of engineering.

Officers elected at the meeting of the Texas section of the American Society of Civil Engineers recently were Ed N. Noyes, Corpus Christi, president; C. M. Thelin, Forth Worth, and Willard Simpson, San Antonio, vice presidents; and John H. Focht, Austin, secretary-treasurer.

Mundell Bush on Nov. 3 was elected to a full term as highway commissioner from the Southern district of Mississippi. Mr. Bush's home is in Hattiesburg.

The Tennessee Valley Section, American Association of Civil Engineers, at its annual convention last month elected Harry Wiersema, TVA engineer, as president. Four vice presidents elected were A. T. Granger, professor at the University of Tennessee, for Knoxville; T. D. Lebb, Chattanooga; Frank Derby, Muscle Shoals, Ala., and T. E. S. Thorpe, Asheville, N. C.

John M. Hepler, director of the bureau of engineering, Michigan State Department of Health, was elected president of the Michigan Public Health Association at its recent annual conference in Grand Rapids. Other officers named are president-elect, Nathan Sinai, School of Public

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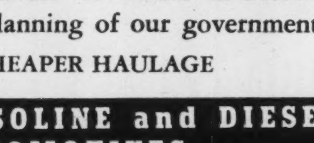

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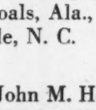

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CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

WATER SUPPLY

OPOSED WORK

riz., Phoenix—R. J. Heyne, city mgr., City ll, pipelines for connections with 4 wells city water supply. $208,000. Applied for A funds.

Md., Baltimore — Water Dpt., Municipal Bldg., water tunnel, $2,235,000, and pump- station, etc., incl. Contr. 1, 9,500 ft. 60 in. -con. pipe $298,000, Contr. 2 36,000 ft. 48 rein.-con. pipe $988,000, Contr. 3, intake n $55,000, pumping and chlorinating station 0,000, Contr. 5, chlorinating equip. $30,000; tr. 6, sedimentation basin, $250,000.

Mont., Helena—City, water well constr., necting piping. $15,000. **FWA.** CD 4/16—R 4/22.

Okla., Camp Gruber (br. Muskogee)—U. S. ., 416 Wright Bldg., Tulsa, Zone 2, emer- cy water supply sys., Sol. No. 34-066-44-32, ,000 or more.

a., Aliquippa—Boro, E. W. Devitt, secy., nicipal Bldg., 3 water wells, Craw Island- o River, steel tubing, 200,000 gal. per day. rris Knowles Co., 1312 Park Bldg., Pitts- gh, boro engr.

a., Midland—Midland Water Co., H. F. lloway, mgr., 843 Midland Ave., preliminary ns 1 and 2 story, 52x192 ft., brick, con- te above ground and equivalent to 1½ ry rein.-con. underground filtration plant, n. to water supply plant, incl. mixing mbers, flocculator, clarifier, coagulation in, filters, filtered water reservoir and h lift station. Morris Knowles Co., 1312 k Bldg., Pittsburgh, engr. CD 11/24—R 12/2.

a., Phila.—Bids soon, laying water pipe, purtenances in Cottage St. from Bridge St. point 160 ft. northeast of Bridge St.; in lmire Ave. from Verree Rd. to New York rt Line Railroad; Third St. from Anns- y to Courtland Sts.; F St. from Marley to Smylie Rd.; Mayfair St. from Roosevelt d. to Montour St.; Harrison St. from How- d St. to Tabor Ave.; Loretta Ave. from tt St. to Godfrey Ave.; Clarkson Ave. from echer to Front Sts.; Hasbrook Ave. from tner St. to Cheltenham Ave.; east side of osevelt Blvd., from Pratt St. to Godfrey e. $25,000-$50,000.

Tex., Killeen—Federal Works Agency, 702 ctric Bldg., Fort Worth, addnl. water lines, ilities, $58,200.

DS ASKED

Bids Asked December 22

is., Manitowoc—Bd. P. Wks., developing, nishing water supply from 5 to 9 mi. gal. day (Ranney Sys.)

Bids Asked December 29

Tex., Kingsville—Mayor, City Hall, Contr. water imprvs., Tex. 41-515. $26,675. **FWA.** ns deposit $10, Peurifoy & Patterson, Box 1, engrs. CD 7/1—ENR 7/8.

Bids Asked January 3

Tex., Weatherford—C. F. Russell, mayor, y Hall, water imprvs., Tex. 41-643. $50,000. ns deposit $25, J. J. Rady, Insurance Bldg., rt Worth, engrs. CD 11/11—ENR 11/18.

W BIDDERS

. C., Wash.—District Comrs., District Bldg. c. 7, 10 m.g. concrete reservoir, Fort Stan- Park, from Baltimore Contracting Co., 711 Central Ave., Baltimore, Md., Bid B 4,375. CD 11/19—ENR 11/25.

a., Macon—Bd. Water Comrs., C. T. Wil- mson, chn., City Hall, Dec. 1, maintenance p bldg., at City Waterworks, from R. A. wen Constr. Co., Macon, **$58,255.** CD 11/23.

d., Hyattsville — Washington Suburban itary Comn., Hamilton St., Dec. 3, Contr. -W & S, watermains, sewers, from C. E. nce, Arlington, Va., **$22,328.** CD 11/19—R 11/25.

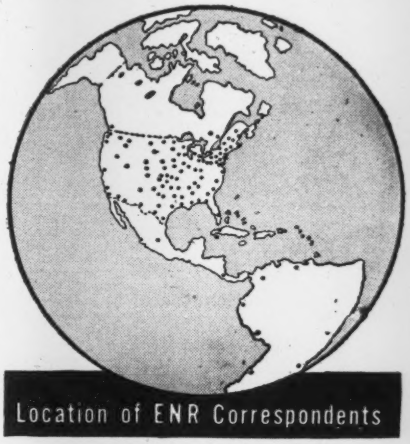
NTRACTS AWARDED

N. M., Carlsbad—U. S. Eng., 4 and Gold ., Albuquerque, addnl. WW facilities, to H. Fulton Co., Lubbock, Tex., **$17,201.**

N. M., Santa Fe—U. S. Eng., 4 and Gold ., Albuquerque, addnl. facilities, WW, ers, to Marchant Bros., Albuquerque. **,061.**

Rhode Island—U. S. Eng., 819 Industrial st Bldg., Providence, water sys., No. 44/68, ck Island Beach St., Newport Co., to Cam- nella & Cardi Constr. Co., 86 Weybosset St., vidence, Est. under **$50,000.** Bids 12/7.

. I., North Kingston—R. W. Rodman, chn., ater Com., water sys. imprvs., School St. d Plantation Manor, to A. E. Bragger nstr. Co., 333 Potter Ave., Warwick, **$18,300.** ds 12/3. Jenks & Ballou, 2600 Industrial st Bldg., Providence, **engrs. CD** 12/1.



Location of ENR Correspondents

Symbols and Abbreviations Include:

†	Federal Government
★	Project of $500,000 or over
ENR	Engineering News-Record
CD	Engineering News-Record Construction Daily
A-E-M	Architect-Engineer-Management type of contract

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply
Sewers, Waste Disposal
Bridges
Streets & Roads
Earthwork, Waterways
Unclassified
Latin America
Public Buildings
Commercial Buildings
Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):
BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);
LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.
CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Note: To comply with censorship requirements, addresses on some reports are being generalized. Data which would reveal the purpose of the improvements and the size are withheld. The name of contractor and general area are reported.

†Tex., Camp Bullis—U. S. Eng., Fort Sam Houston, addnl. water supply, facilities, to Engineering Contractors, 923 Roosevelt Ave., San Antonio, approx. **$15,000.** Bids 12/1.

Tex., Mission—L. Duncan, mayor, City Hall, water line extens., imprvs., to Reising Constr. Co., Edinburg, approx. **$15,000.**

†Wash., Forks—U. S. Eng., 800 3 Ave., Seattle, Zone 4, water supply, sewers, distr. sys., to Sullivan, Lynch & Hainsworth, 1822 McGilvra Blvd., Seattle, **$23,144.**

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Ark., Harrison—City, L. C. Holt, mayor, imprvs., exten. sewerage sys. $75,000. M. L. Crist, 321 Brown St., Little Rock, engr.

Ark., Stamps—City, W. D. Kelley, mayor, sewerage sys., disposal plant. $90,000. M. L. Crist, 321 Brown St., Little Rock, engr.

Colo., La Junta—Arranging to call special election to vote $40,000 bonds sanitary sewerage sys. G. Hine, city engr.

†Conn., Bridgeport—F. Schwarzkopf, clk. Hy. Com., City Hall, Contr. 11, chlorinating facilities, $25,000; Contr. 7, sanitary and storm sewers, Stratford and Waterview Aves., $95,000; Contr. 10, plans ready late in January trunk and storm sewers, Sect. 2, Water St., $225,000; Conn. 6-107, all **FWA.** H. L. Rowland, City Hall, engr. CD 12/13.

Conn., Milford—Town Bd. Sewer Comrs., Wm. Boynton, secy., Town Hall, preliminary surveys new sewer mains, sewage disposal sys. exten. Over $25,000.

Md., Baltimore—Sewer Dpt., Municipal Bldg., sewage pump. station, $330,000.

Miss., Woodville—W. J. Stockeet, mayor, sewerage sys., $35,000 (not official). M. W. Brown, McComb, engr.

Tex., Houston—City, bids soon, replacing 36 in. sanitary sewer main, Ruth St. $35,000.

Tex., Houston—Sanitary sewers S. McGregor Way, Grand Blvd., Charleston St., Cameron Dr. $25,000.

Tex., Houston — City, M. H. Westerman, secy., City Hall, bids soon sanitary sewer in Ruth St. $35,000. J. G. Turney, dir. P. Wks.

†Tex., Killeen—Federal Works Agency, 702 Electric Bldg., Fort Worth, addnl. sanitary sewer collection lines, facilities. $90,525.

Tex., Nederland—H. C. Farris, mayor, City Hall, addnl. sewage facilities. $56,851. Applied for **FWA** funds. Chas. P. Smith, Orange, engr.

†Va., Norfolk—City made preliminary plans 3 story garbage incinerator, brick, rein.-con., to house 4 incinerator units, Va. 44-355. $266,100. **FWA.** Rudolph, Cooke & Van Leeuwen, Inc., Arcade Bldg., archts.

Alaska, Ketchikan—City, City Hall, sewerage sys. $75,000.

Man., Winnipeg—Greater Winnipeg Sanitary Dist., W. M. Scott, chn., installing sewers. $130,000.

Ont., Tilbury—East Tilbury Twp., Tilbury, drainage sys. J. J. Newman, Bartlett Bldg., Windsor, engr.

BIDS ASKED

Bids Asked December 20

N. Y., Stapleton (sta. Staten Island)—Comr. Marine & Aviation, Pier A, foot of Battery Pl., North River, New York, Zone 4, Contr. 2394, repairing portion existing sanitary sewer under inshore end Pier 14, foot of Canal St., Richmond Boro. Plans deposit $1.50.

Bids Asked December 23

†Conn., Bridgeport — F. Schwarzkopf, clk. Hy. Comn., City Hall, Contr. 9, Sect. 1, 2,600 ft. 54 in. trunk sewers, 2,900 ft. storm sewers, appurtenances, Conn. 6-107. **FWA. Plans** deposit $10. H. L. Rowland, city engr. CD 12/7—ENR 12/9.

Bids Asked In January

Conn., New Haven—City, Hall of Records, 24 in. sanitary sewers, Poplar and James Sts. Over $25,000.

Bids Asked January 6

†Tex., Groves—Jefferson Co. Water Control & Imprv. Dist. 1, sewer imprvs., Tex. 41-597. $55,000. Plans deposit $25, J. B. Converse & Co., Inc., Port Arthur, engrs. CD 11/23—ENR 11/25, under CA.

CONTRACTS AWARDED

Calif., Long Beach—Vitr. clay sanitary sewer, Dist. 13, to B. D. Zaich & Son, 309½ W. Bway, Glendale, **$33,126.** Bids 11/10.

Calif., Los Angeles—City, 1 in. thick rein.-con. blanket over portions Sect. 6 of outfall sewer near Centinella Blvd. and Sinoloa Rd., Schedule 1, to Rhoades Bros. & Shofner, 3869 Medford St., **$218,707*****Schedule 2, to Oberg Bros., P. O. Box 640, Inglewood, **$27,856***** repairing portions Sect. 6 of outfall sewer, Osage Ave. to Sepulveda Blvd., to Case Constr. Co., P. O. Box 6, San Pedro, **$38,500.** Grand total **$285,063.** Bids 11/17. CD 10/28.

N. J., East Orange—City of East Orange, Summit and Newark Twps. of Hillside, Union, Maplewood and Millburn, Boro of Roselle Park, Towns of Irvington and West Orange, Village of South Orange, City Hall, East Orange, supplementary sewer tunnel, 66 in. steel liner plate job constructed by compressed air, to Square Constr. Co., S. Haven St., Baltimore, Md., **$303,821.** Bids 11/26. CD 11/10—ENR 11/11.

†Tex., Texas City—E. K. Johnson, mayor, City Hall, sanitary sewers and sewage lift station for Snug Harbor addn., Tex. 41-640, to Couch Constr. Co., Dothan, Ala., **$33,221. FWA.** Bids 12/6. CD 11/18—ENR 11/25.

†Tex., West Columbia—W. M. Greenwood, mayor, City Hall, sanitary sewerage sys., Tex. 41-606, to Russ Mitchell, Inc., 2302 Jefferson Ave., Houston, **$75,615. FWA.** CD 11/22—ENR 11/25, under LB.

†W. Va., Huntington—At office F. S. Whitney, city engr., City Hall, completion flood wall interceptor sewerage sys., Guyandotte Sect., W. Va. 46-138, to Bishop & Robinson, 250 Court St. W., **$26,700. FWA.** Bids 11/29. CD 11/23—ENR 10/14.

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SEWERS and WASTE DISPOSAL (Contra
Awarded, Cont'd.)

Que., Almaville—Sewer exten., to Laviole Constr. Co., Ltd., 453 Laviolette St., Th Rivers. Est. **$28,000.** A. E. Delisle, 224 Ave., Shawinigan Falls, engr. CD 10/2 ENR 11/4.

BRIDGES

PROPOSED WORK

N. Y., Little Valley—Bd. Supervs. Catt raugus Co., steel, concrete hy. bridge, Sa dinia Rd. **$80,000.**

LOW BIDDERS

Connecticut—Wm. J. Cox, comr., State Dpt., Hartford, Dec. 6, removing 1,423 ft. O Hy. bridge over Thames River, towns Groton and New London, from Merritt-Cha man & Scott Corp., 292 Pequot Ave., N London, **$71,140.** CD 11/22—ENR 11/25.

Illinois—State Div. Hys., Springfield, reco structing portion I-Beam bridge over W Lake, Mason Co., from Eric Bolander Cons Co., Winchester Rd., Libertyville, **$60,778.** C 9/21—ENR 9/23.

CONTRACTS AWARDED

Idaho—J. E. Wood, act. comr. P. Wk Boise, repairing Eagle Bridge and chann imprv. on Eagle-Meridian Hy. and repairi Pier 1, of Fairview Bridge, on Old Oreg Trail, Ada Co., to J. A. Terteling & Son Robert Noble Bldg., Boise, **$128,810.** E $96,844. Bids 11/12. CD 11/8.

Que., Ste. Anne de la Perade—Municipalit reconstructing bridge over River, to Savard Terrier, Ste. Anne de la Perade. Est. **$25,0**

STREETS AND ROADS

PROPOSED WORK

★**Pennsylvania**—State Hy. Dpt., Harrisbur super hy. connecting Water St. Imprv Pittsburgh and William Penn Hy. near Wi kinsburg, 4 and 6 lane hy., approx. 9½ mi with 1 tunnel, Allegheny Co., $20,000,00 Michael Baker, Jr., Baker Bldg., Rocheste design. engr.

BIDS ASKED

Bids Asked December 20

†**Pa., Aliquippa**—Boro, E. W. Devitt, secy Municipal Bldg., bituminous on stone pavin Waugman Ave. and Gregory St., Pa. 36-17 $25,000. Plans deposit $15. Morris Knowle Co., 1312 Park Bldg., Pittsburgh, boro eng

Bids Asked December 21

Virginia—Dpt. Hys., Richmond, waterboun macadam surface treatment 2.47 mi. Route 2 & 652, SP DA-WR 130-C,D, B1, FP DA-W 32-A(1), Fauquier Co.; concrete curbin guttering 0.154 mi. Route T-1121, SP S-104 M (C & G), Phoebus Co. Plans deposit ea. proj.

LOW BIDDERS

Arizona—State Hy. Dpt., Phoenix, Nov. 3 imprv. 4.3 mi. DA-WR 66 (1) AFE 98 7 from Kolob Constr. Co., P. O. Box 183 Phoenix, **$34,891.** CD 11/18.

D. C., Wash.—District Comrs., Distric Bldg., Dec. 8, repairing asphaltic pavement concrete bases, with 3,000 tons asphaltic ma terials, west sect., from Corson & Gruma Co., 33 and K Sts. N.W., **$138,570;** east sect from McGuire & Rolfe, Inc., 1401 1 St. S.E **$138,923.**

D. C., Wash.—District Comrs., District Bldg Dec. 9, furnishing 6,000 tons bituminous concrete mixture, from McGuire & Rolfe, Inc 1401 1 St. S.E., **$35,400.** CD 12/6.

Kentucky—State Hy. Dpt., Frankfort, Dec 10, imprv. 1.555 mi. Carter Co., from Kentucky Road Oiling Co., Frankfort, **$28,61** CD 11/23—ENR 11/25.

CONTRACTS AWARDED

†**Calif., Muroc**—U. S. Eng., 751 S. Figuero St., Los Angeles, Zone 14, 7 in. concrete paving 230,000 sq. yd., Kern Co., to Bressi-Bevanda Constr. Co., 208 W. 8 St., Lo Angeles. Est. over **$25,000.**

†**Ky., Fort Knox**—U. S. Eng., 612 Federal Bldg., Louisville, resurfacing roads, Contr. 15-029-Eng-324 to Breslin Constr. Co., 1801 S Brook St., Louisville, **$51,507.**

†**Okla., McAlester**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., access roads, to magazine and storehouse, Naval Ammunition Depot, NOY 7552, to Brown & Root, Inc., and W. S. Bellows Constr. Co., McAlester, **$397,000.** CD 12/1.

Utah—State Rd. Comm., State Capitol, Salt Lake City, imprv. 16.4 mi. Tooele Co., to Hunt & Frandsen, Elko, Nev., **$469,875.** Est. $507,632. Bids 11/17. CD 11/11.

EARTHWORK, WATERWAYS

PROPOSED WORK

†**Idaho**—U. S. Eng., Pittock Blk., SW 1 Ave. and Washington St., Portland, Ore., repairing flood structures between Heise and Robert on south fork of Snake River. $42,50

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EARTHWORK and WATERWAYS (Proposed Work, Cont'd.)

†Idaho, Boise—U. S. Eng., Pittock Blk., SW. 10 Ave. and Washington St., Portland, Ore., bids soon riprapping Boise River banks, near here. $200,000.

Que., Chelsea—Gatineau Power Co. Ltd., 140 Wellington St., Ottawa, Ont., dam reconstruction. $30,000.

LOW BIDDERS

Idaho—Dpt. P. Wks., Boise, Dec. 7, imprv. Boise River channel, Canyon Co., from Vernon Bros. Co., 8 and Orchard Ave., Boise, **$19,500.** CD 12/1.

New Jersey—Bd. Commerce & Navigation, State House, Trenton, Dec. 6, No. 192, dredging 120,000 cu. yd. Barnegat Bay, Petit Island to Carrel Island and No. 193, dredging 110,000 cu. yd. Pecks Bay, from Hill Dredging Corp., Ventnor City, **$16,200** and **$19,250** respectively. CD 11/17—ENR 11/25.

CONTRACTS AWARDED

†Calif., Gridley—U. S. Eng., 1209 8 St., Sacramento, Zone 8, 1,500 ft. levee exten. on Feather River, ½ mi. north of Gridley Bridge, near here, to A. Teichert & Son, Box 113, Sacremento. Esst. **$30,000.**

★**†Colo., Leadville**—U. S. Bureau of Mines, Security Bldg., Denver, 17,300 ft. drainage tunnel to unwater mines, Leadville Dist., to Stiers Bros. Constr. Co., Leadville, Colo. and 2944 Magazine St., St. Louis, Mo., **$1,400,000.** Awarded 12/4. CD 11/3—ENR 11/11.

UNCLASSIFIED

PROPOSED WORK

†Colorado—APRONS, etc.—U. S. Eng., 909 17 St., Denver, bids soon concrete aprons, paving, grading in front of 300 igloos, concrete floors in open storage shed, Pueblo Co. $100,000.

†Colo., Colorado Springs—TAXIWAY—U. S. Eng., 909 17 St., Denver, bids soon taxiway constr., incl. stabilized base, asphalt surfacing, concrete taxiways at an airfield, Peterson Field, near here. $150,000. CD 12/7—ENR 12/9.

†Fla., Fort Lauderdale—TORPEDO TRAINING FACILITIES—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., torpedo training facilities, Naval Air Station, $32,300.

†Fla., Hollywood—CONSTRUCTION—Yards & Docks, Navy Dpt. 18 St. and Constitution Ave. N.W., Wash., D. C., construction at Naval Air Gunners School, $27,000.

†Fla., Miami—AIR STATION BLDG.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., dispensary exten. Naval Air Station, $92,800.

†Fla., Pompano—CONSTRUCTION—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., construction, Pompano Field. $60,700.

†Fla., Smyrna—GUNNERY FIELD TRAINING FACILITIES—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., gunnery training field facilities, $42,000.

Illinois—RURAL ELECTRIFICATION SYSTEM—Rural Electric Convenience Cooperative Co., Divernon, exten. rural electrificatoin sys. $50,000.

Illinois—RURAL ELECTRIC LINES—Illinois-Iowa Power Co., Champaign, 3.01 mi. rural electric lines, Macon and Madison Counties.

Ia., Mt. Pleasant—AIRPORT—J. P. Budde, city clk., special election Dec. 22 to vote on tax for purchasing airport site. $36,000.

Louisiana—OIL WELL, etc.—Union Sulphur Co., et al, Lake Charles, drilling, developing test oil well, storage facilities, Jefferson Davis Parish. Over $25,000.

Louisiana—OIL PIPELINE—Shell Oil Co., Lake Charles, installing, maintaining 6 in. oil pipeline under and across Bayou Guy, at point about 2,200 ft. above its mouth at Calcasieu River, approx. 2.7 mi. northeasterly from Calcasieu, in Calcasieu Parish.

Mass., Medford—SWIMMING POOL, etc.—Tufts College, completing plans rein.-con. swimming pool, gymnasium. Over $25,000. Arland & Dirlam, 124 Cedar St., Malden, archts.

Mass., Wellesley — PARK-PLAYGROUND FACILITIES—Town Bd. Park Comrs., park-playground facilities, incl. baseball and football facilities, skating pond, tennis courts, outing facilities, hockey rink, Fels Dist. Over $25,000.

★**Mass., Worcester** — AIRPORT — Dpt. P. Wks,. City Hall, airport construction, $2,000,000. E. Perry, 123 Apricot St., engrs.

★**Mo., St. Louis**—TRACK WORK, etc.—St. Louis-San Francisco Ry. Co., F. G. Jonah, ch. engr., Frisco Bldg., 9 and Olive Sts., Zone 1, 4.12 mi. new tracks west of Gasconade River, various other addns., betterments, eliminating 11 dangerous curves, steep grade. $2,-83,662.

★**Mo., St. Louis**—RELAYING TRACKS, etc. —St. Louis Southwestern Ry. Co., W. S. Hanley, ch. engr., Tyler, Tex., relaying tracks with heavier rail, $647,965; ballasting tracks, $640,721, new tracks, track changes and extens., $352,052; other various projects, incl. bridges, bldgs., etc. Total cost $2,815,092.

Mo., Springfield—AIRPORT BLDGS, etc.—City, H. B. Carr, mayor, City Hall, airport bldg., relocation of road, $229,618. Gene Johnson, Landers Bldg., archt. L. A. Weeks, city engr.

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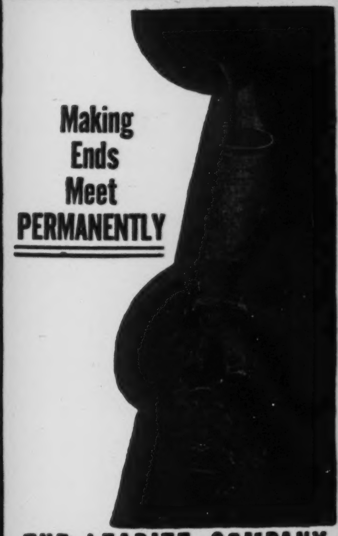

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ALCO PRODUCTS DIVISION
30 CHURCH ST., NEW YORK N.Y. DUNKIRK, N.Y.

UNCLASSIFIED (Proposed Work, Cont'd.)

O., Hiram—SWIMMING POOL—Hiram College, Dr. P. H. Fall, pres., Hiram, raising funds, swimming pool. $150,900. J. W. Everhard, 9219 Clifton Rd., Cleveland, archt.

†Tenn., Smyrna — BOMBER TRAINING BASE—U. S. Eng., Grant St., west of Westwood St., Mobile, Ala., expanding bomber training base. Under $200,000.

Texas—GAS or OIL WELLS—Rogers Lacy, Longview, drilling, casing, developing 6 or more deep gas or oil wells, Panola Co. $100,000.

Texas—OIL WELLS—Phillips Petroleum Co., et al, Esperson Bldg., Houston, and Bartlesville, Okla., drilling, developing 1 or more deep test oil wells, incl. necessary ground storage, fuel lines, between Anson and Stamford. Over $25,000.

Texas—RURAL ELECTRIFICATION SYSTEM—Erath Co. Electric Cooperative Assn., Stephenville, exten. rural electrification sys. $75,000.

Tex., Abilene—OIL WELL—E. L. Wilson, et al, drilling, developing 5,500 ft. test oil well, earthen pits, etc. Over $25,000.

Tex., Abilene—OIL WELL—O. P. Leonard, et al, 5200 Crestline, Fort Worth, drilling, developing new 6,500 ft. test oil well, earthen pits, etc., 15 mi. northeast of here. Over $25,000.

Tex., Alfred—OIL WELL—Wilcox Oil & Gas Co., Alice, drilling, developing new 6,500 ft. test oil well, 3 mi. south of here. Over $25,000.

Tex., Antelope—OIL WELL, etc.—L. T. Burns & Associates, drilling, developing another 6,250 ft. test oil well, earthen storage pits, fuel line, 2½ mi. north of here. Over $25,000.

Tex., Aqua Dulce—OIL WELL, etc.—Texon Royalty Co., Alamo National Bldg., San Antonio, drilling, developing new 6,000 ft. test oil well, earthen storage facilities. Over $25,000.

Tex., Aransas Pass—OIL WELL—Continental Oil Co., et al, Oil & Gas Bldg., Houston, drilling, casing, developing new 9,500 ft. test oil well. Over $25,000.

Tex., Banquete—OIL WELL, etc.—Hewitt & Daugherty, Corpus Christi, drilling, casing, developing new $6,500 ft. test oil well, earthen storage facilities, 10 mi. northwest of here. Over $25,000.

Tex., Bastrop—OIL WELL—J. D. Andrews, Dallas National Bank Bldg., Dallas, drilling, developing new 6,000 ft. test oil well. Over $25,000.

Tex., Beeville—OIL WELL—Bridwell Oil Co., Corpus Christi, drilling, developing 4,500 ft. test oil well, 4 mi. east of here. $25,000.

Tex., Benavides—OIL WELL—M. E. Davis, et al, drilling, developing new 6,000 ft. test oil well, 4 mi. west of here. Over $25,000.

Tex., Calliham—OIL WELL—Morris Drilling Co., Three Rivers, drilling, developing oil well, 3.6 mi. south of here.

Tex., Chapel Hill—OIL WELL, etc.—Texas Co., 720 San Jacinto St., Houston, drilling, developing new 7,000 ft. test oil well, earthen storage, etc. Over $25,000.

Tex., Conroe—OIL WELL—Atlantic Refining Co., et al, Esperson Bldg., Houston, drilling, casing, developing new 12,000 ft. test oil well, storage facilities, $50,000.

Tex., Corpus Christi—OIL WELL, etc.—E. Calloway, et al, Corpus Christi, drilling, casing, developing new 5,700 ft. test oil well, earthen storage facilities, northwest of here. Over $25,000.

Tex., Elgin — OIL WELL — J. E. Schultz, Elgin, drilling, developing new 7,000 ft. test oil well, 7 mi. west of here. Over $25,000.

Tex., Eliasville — OIL WELL — Anderson-Prichard, et al., Olney, drilling, developing new 3,700 ft. test oil well, 5 mi. south of here.

†Tex., Ellington Field (br. Houston)—AIRFIELD BLDG.—U. S. Eng., 25 St. and Avenue F, Galveston, celestial navigation training bldg., etc.

Tex., Ganado—OIL WELL—W. Stewart Boyle, State Bank Bldg., Houston, drilling, developing new 8,000 ft. test oil well, 6 mi. west of here. Over $25,000.

Tex., Goliad—OIL WELL—Forest Development Corp., Milam Bldg., San Antonio, drilling, casing, developing 6,000 ft. test oil well, earthen storage facilities. Over $25,000.

Tex., Goliad—OIL WELL—G. E. Green, et al, South Texas Bank Bldg., San Antonio, drilling, casing, developing new 4,500 ft. test oil well, earthen storage, fuel line, etc. $25,000.

Tex., Goliad—OIL WELL—G. E. Green, et al, Goliad, and South Texas State Bank Bldg., San Antonio, drilling, developing 5,500 ft. test oil well, earthen storage facilities, etc., 4 mi. east of here. Over $25,000.

Tex., La Ward—OIL WELL—Bering Co., Edna, drilling, developing 5,450 ft. test oil well. Over $25,000.

†Tex., Matagorda—TAXIWAY—U. S. Eng., Santa Fe Bldg., Galveston, constr. Taxiway A, at Bombing and Gunnery Range, over $25,000.

Tex., Mineola—OIL WELL—Roeser & Pendelton,, Inc., Fort Worth Club Bldg., Fort Worth, drilling, casing, developing 7,000 ft. test oil well, storage facilities, fuel line, near here. Over $25,000.

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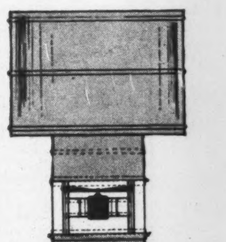

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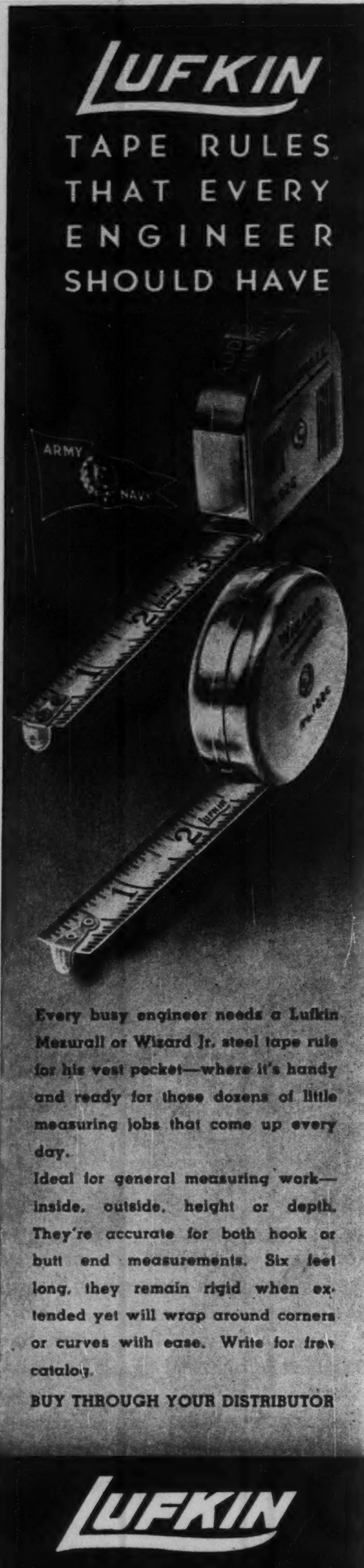

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UNCLASSIFIED (Proposed Work, Cont'd.)

Tex., Moore—OIL WELL—Highland Oil Co., Oil & Gas Bldg., Houston, drilling, casing, developing 6,000 ft. test oil well, earthen storage. Over $25,000.

Tex., Pecos—OIL WELL—Phillips Petroleum Co., Esperson Bldg., Houston, drilling, developing new 4,100 ft. test oil well. $25,000.

Tex., Pittsburg—OIL WELL—Harry Moss Petroleum Co., Firs National Bank Bldg., Dallas, drilling, casing, developing new 6,000 ft. outpost test oil well, earthen pits. Over $25,000.

Tex., Point—OIL WELL—Central Pipe Line Co., et al., Cleveland, drilling, developing 8,000 ft. test oil well, earthen storage. Over $25,000.

Tex., Roma—OIL WELL—Osborn & Fleet, Rio Grande City, drilling, developing new 5,000 ft. test oil well, earthen pits. Over $25,000.

Tex., Realitos — OIL WELL — Continental Oil Co., Oil & Gas Bldg., Houston, drilling, developing new 3,500 ft. test oil wel. Over $25,000.

Tex., Sinton—OIL WELL—Pantex Oil Co., Corpus Christi, drilling, developing new 5,000 ft. test oil well, $25,000.

Tex., Skidmore—OIL WELL—Sohio Production Co., First National Bank Bldg., Oklahoma City, Okla., drilling, developing new 5,200 ft. test oil well, storage facilities, etc., north of here. Over $25,000.

Tex., Smithville—OIL WELL—J. D. Andrews, et al, drilling, developing new 5,000 ft. test oil well, 1 mi. south of here. $25,000.

Tex., Tahoka—OIL WELL, etc.—Sohio Producing Co., Tahoka, drilling, developing new 7,000 ft. test oil well, earthen pits, etc., north of here. Over $25,000.

Tex., Tanglewood—OIL WELL—Coffield & Robinson, Giddings, developing 6,000 ft. test oil well, storage facilities, north of here. Over $25,000.

Tex., Yorktown—OIL WELL—Butcher-Arthur, Inc., 301 Bway., Houston, drilling, casing, developing new 8,500 ft. test oil well, earthen storage facilities, fuel line. Over $25,000.

Tex., Velasco—OIL WELL—Magnolia Oil Co., et al., Continental Bldg., Dallas, new 13,000 ft. test oil well, 8½ in. casing, earthen storage, etc. Over $25,000.

†Va., Richmond—AIR BASE FACILITIES—U. S. Eng., Fort Norfolk, Norfolk addnl. facilities at air base.

★**†West Virginia**—AIRPORT IMPROVEMENTS—Civil Aeronautics Admin., La Guardia Field, Jackson Heights, N. Y., airport imprvs. Wood Co. $600,000. A. H. Wessel, Bessemer Bldg., Pittsburgh, Pa., engr. CD 6/24—ENR 7/1.

Wisconsin — RURAL ELECTRIFICATION SYSTEM—Barron Co. Electric Cooperative, Barron, exten. rural electrification sys., $55,000.

Wisconsin — RURAL ELECTRIFICATION SYSTEM—Oconto Electric Cooperative, Oconto Falls, exten. rural electrification sys. $80,000.

★**B. C., Vancouver**—FISH WAY—Secy. Dpt. P. Wks., Victoria, bids soon, fish way or ladder, for Salmon to improve fish passage at Hell's Gate Canyon on Fraser River, for Provincial Govt., Victoria. $2,000,000.

★**Quebec**—RAILROAD LINE—Canadian National Railways, H. A. Dixon, ch. eng. (oper.), 360 McGill St., Montreal, 15 mi. line from Eastern Junction to Bout-deL'Ile on Island of Montreal to open new residential and industrial area in Montreal, which will permit passenger trains operating between Lake St. John and Abitibi Dists. direct access to new Canadian National Central Station. $2,870,000.

Quebec—RAILROAD EXTENSION—Canadian National Railways, H. A. Dixon, ch. engr. (Oper.), 360 McGill St., Montreal, exten. Canada Gulf Terminal R. R. from Matane to Gaspe region.

Que., Chelsea—DAM, etc.—Gatineau Power Co., Ltd., 140 Wellington St., Ottawa, Ont., repairing dam and reconstructing 1,500 ft. flume. $29,000.

Que., Three Rivers—SWIMMING POOL, etc.—Municipality, A. Beliveau, clk., swimming pool, public park. $40,000.

BIDS ASKED

Bids Asked About December 20

O., Cleveland — ASH PITS — Pennsylvania Railroad, C. I. Leiper, ch. engr. (Central Region), Penna. Sta., Pittsburgh, Pa., 3 water type, rein.-con. ash pits, 230 ft. in length.

Bids Asked December 21

†Ga., Warner Robins—AIRPORT PAVING and DRAINAGE—U. S. Eng., Post Office Bldg., Savannah, paving, drainage structures at airport. Extended date. CD 11/30—ENR 12/2.

Bids Asked December 23

★**New York**—AIRPORT WORK—Comr. Marine & Aviation, Pier A, foot of Battery Pl., North River, New York, Zone 4, Contr. 2400, placing hydraulic fill, Contr. 4, Idlewild Airport, Queens. Plans deposit $5. Jay Downer, 30 Rockefeller Plaza, New York, Zone 20, engr.

Wash., Seattle — TRANSMISSION LI RIGHT-OF-WAY CLEARING—Bd. P. W County-City Bldg., Zone 4, clearing 288 ac transmission line right-of-way between Bot and Renton. Plans deposit $5. E. R. H man, City Light Bldg., Zone 1, engrs.

Bids Asked About December 27

★**†Miss., Natchez**—AIRPORT—U. S. E Grant St., west of Westwood St., Mob Ala., airport, incl. runways, taxiways, gr ing, etc. $593,325. CD 10/5—ENR 10/7.

Bids Asked December 29

†Ala., Troy—AIRPORT—Civil Aeronau Admin., 84 Marietta St. N.W., Atlanta, airport, Proj. No. 24-133, incl. clearing, gr bing, paving, drainage, paving, seedi fencing.

Bids Asked

★**†Tex., Matagorda**—RUNWAYS, etc.—U. Eng., 25 St. and Avenue F, Galveston runways, addnl. parking aprons, etc., air at Matagorda Peninsula Zone. $500,000 lotted. Plans deposit $25. CD 12/2—E 12/9.

LOW BIDDERS

†South Carolina—PILE DOLPHINS—U. Eng., 33 Customhouse, Charleston, Nov. constructing tie-up pile dolphins waterw No. 38-081-44-86 Neg, Charleston to Beauf from R. L. Morrison & Sons, McClellanvi under **$50,000.**

†S. C., Charleston—APRON PAVING—U. Eng., 33 Customhouse, Charleston, Nov. apron paving at army air base, No. 38-181-94, from Wm. F. Bowe & Co., Augusta, **$100,000-$200,000.**

CONTRACTS AWARDED

†Calif., Richmond — ELECTRIC POW DISTRIBUTION SYSTEM—H. J. Kaiser Latham Sq. Bldg., Oakland, electric po distr. sys., Shipyard 2, to T. L. Rosenb Co., 362 5 St., Oakland. Federally financ

†Calif., San Diego—NAVAL AVIATI CENTER MAGAZINES, etc.—Yards & Doc Navy Dpt., 18 St. and Constitution Ave. N. Wash., D. C., magazines, outlying field, Na Aviation Center, NOY 6807, to A. B. H man, 310 15 St., Santa Monica, **$143,600.** 11/29, under Public Bldgs., LB.

†Calif., Wilmington — OPEN STORA AREAS, etc.—U. S. Eng., 751 S. Figueroa Los Angeles, Zone 14, open storage are paving, fencing, No. 320, Los Angeles to Bonadiman-McCain, 1709 W. 8 St., Angeles, **$114,981.**

†Colorado—AIRFIELD BUILDINGS—U. Eng., 909 17 St., Denver, 3 magazines, cel tial navigation trainer bldg., boiler house, Peterson Field, El Paso Co., to R. E. We Montrose, over **$60,000.** CD 12/9, under

†Florida—RANGE, etc.—U. S. Eng., Riverside Ave., Jacksonville, Zone 2, cl combat range, village fighting course, C Co., to B. B. McCormick & Sons, Inc., Grah Bldg., Jacksonville, approx. **$40,000.**

†Florida—RUNWAYS, etc.—U. S. Eng., Riverside Ave., Jacksonville, Zone 2, streng ening runways, taxiways, hardstands, apro Neg-Jax-44-358, Highlands Co., to H. Wolfe Constr. Co., St. Augustine, **$475,3** Awarded 11/29.

†Fla., Gainesville—CLEARING, GRUBBIN etc.—U. S. Eng., 575 Riverside Ave., Jackso ville, Zone 2, clearing, grubbing, excav., et Alachua Army Air Field, to John Monagh Inc., Pelham, Ga., **$137,890.** Awarded 12/

★**Louisiana**—PIPELINES, etc.—United G Pipe Line Co., 1515 Fairfield Ave., Shre port, approx. 19.64 mi. 12¾ in. line from Delarge Field, Terrebonne Parish; appr 18 mi. 16 in. line from St. Rose, west loop the existing Lirette-New Orleans Li single 12¾ in. submarine crossing on Miss sippi River near St. Rose, approx. 1.5 mi. in. line from South Houma Field to DeLarge Field 12 in. line, Terrebonne Pari and removing, reconditioning approx. 20 16 in. loop line between Baton Rouge a New Orleans, to Whitaker Pipe Line Ltd., 806 Dan Waggoner Bldg., Fort Wort Tex., **$873,805.**

†Massachusetts—FIRE ALARM SYSTEM U. S. Eng., 819 Industrial Trust Bldg., Pro dence, R. I., installing fire alarm sys., 44/54, Hampden Co., to American Distr Telegraph Co., 44 Vernon St., Springfield. E under **$50,000.** Bids 11/29.

†Mass., Boston—FIRE PROTECTION—U. Eng., 31 St. James Ave., Boston, Mass., f protection, Castle Island, No. 19-023-44-Ne 139, to Automatic Sprinkler Corp. of Ameri 89 Broad St., Boston. Est. **$57,000.** Bi 12/10.

†Mich., Oscoda—AIRFIELD BLDGS.—U. Eng., 700 Union Guardian Bldg., Detroit, cold storage warehouse, warehouse and recr tion bldg., Oscoda Army Airfield, to de Ko ing Constr. Co., Kalamazoo, **$83,225.**

†N. J., Jersey City—SPRINKLER SYSTE —U. S. Eng., 120 Wall St., New York, N. Y., sprinkler sys. for military bldgs., Grinnell Co., 207 Market St., Newark, $25,0

†N. Y., Rome—AIR DEPOT BUILDINGS U. S. Eng., Chimes Bldg., Syracuse, tempora frame bldg., addns. Rome Air Depot, 30-180-Eng-5, to Rathgeb-Walsh, Inc., Broad St., Port Chester, **$89,307.**

O., Cleveland—COALING STATION—Pen sylvania Railroad, C. I. Leiper, ch. eng (Central Region), Penna. Sta., Pittsburg Pa., design and construction 18x52 ft., rei con. coaling station bldg., to Roberts Schaefer Co., 307 N. Michigan Ave., Chica Ill.

NCLASSIFIED (Contracts Awarded, Cont'd.)

†Pa., Mifflin—APRON PAVING—U. S. Eng., 25 New Federal Bldg., Pittsburgh, concrete apron paving at Allegheny County Airport, Mifflin Twp., to Harrison Const. Co., 1101 Western Ave., NS, Pittsburgh, **$30,000.** C. C. Yost, Law & Finance Bldg., Pittsburgh, engr.

†S. C., North Charleston—AIR BASE BUILDINGS, etc.—U. S. Eng., 33 Customhouse, Charleston, addnl. bldgs., utilities, Charleston Auxiliary Air Base, Contr. 38-081-Eng-79, to **C. Y. Thomason Co.,** Greenwood, **93,278.**

†Tenn., Memphis—LIGHTING FACILITIES—U. S. Eng., Grant St., west of Westwood St., Mobile, **Ala.,** addnl. lighting facilities, Auxiliary Airfield Supply Depot, Contr. 01-76-Eng-102, Shelby Co., to Guy-Townsend Co., Jackson, **$29,554.**

†Tenn., Nashville—FACILITIES—U. S. Eng., Grant St. west of Westwood St., Mobile, Ala., addnl. facilities at Berry Field, Ser. No. 221, to Rule & **Murphy,** Memorial Apartment, **158,232.**

†Tex., Abilene—NIGHT LIGHTING SYSTEM—U. S. Eng., Fort Sam Houston, outside electric night lighting sys., facilities, street lighting, etc., Taylor Co., to Gable Elec. Service Co., 6713 Snider Plaza, Dallas, **$42,000.**

†Tex., Foster Field (br. Victoria)—AIR FIELD BLDG.—U. S. Eng., 25 St. and Avenue F, Galveston, B.M. and I Bldg., to Noser Constr. Co., McAllen, **$147,396.**

†Tex., Hondo—NIGHT LIGHTING FACILITIES—U. S. Eng., Fort Sam Houston, outside night lighting facilities for airfield zone, to L. Walker Electric Co., Cleburne, **$31,200.** Awarded 12/4.

†Tex., Pyote—AIRFIELD BLDG.—U. S. Eng., Albuquerque, N. M., addnl. bldg., Airfield Hangar zone, to S. V. Patrick, Albuquerque, N. M., approx. **$35,000.**

Utah, Bingham — TUNNEL—Utah Copper Co., Kearns Bldg., Salt Lake City, 4,500 lin. ft. single track railroad size tunnel from lower Bingham Canyon to company's open copper mine pit, to Utah Constr. Co., First Sec. Bank Bldg., Ogden. Geo. Earl, Kearns Bldg., Salt Lake City, ch. engr.

†Washington—CONSTRUCTION—U. S. Eng., 00 3 Ave., Seattle, Zone 4, addnl. construction, Grant Co., to C. M. Ludberg, P. O. Box 06, Ephrata, **$146,300.**

†Wash., Seattle — CONSTRUCTION — U. S. Eng., 800 3 Ave., Seattle, Zone 4, addnl. construction, to Western Constr. Co., Arctic Bldg., Zone 4. **$26.660.**

★**N. S., Sydney**—WHARF—Dpt. National Defense (Sea), Ottawa, Ont., wharf, Point Eduard Naval Base, to Dominion Constr. Corp., Ltd., Bedford Bldg., Toronto, Ont., **500,000.**

Que., Rivieore Au Renard—WHARF—Dpt. P. Wks., Ottawa, Ont., wharf, to J. U. Ste. Marie, at St. Cleophas St., Beauport, **$198,868.** Bids 10/14. CD 10/5—ENR 10/7.

Sask., Rhein — AERODROME — Dpt. Transport, Ottawa, Ont., addnl. aerodrome development, incl. clearing, grading, drainage, road gravel, to A. Lopston, Bredemburg, about **38,000.**

LATIN AMERICA

Mexico—State of Tamaulipas, Matamoros, c/o Magdaleno Augilar, gov. plans water supply, facilities, $200,000; public school bldgs., facilities, $300,000; highways, grading, bridges, surfacing, etc., $700,000; sanitary sewers and sanitation, $350,000; irrigation, $450,000.

Mexico, Mexico City—Pub. Health Dpt. of Public Bldgs. Admin., Mexico City, E. Suarez, secy. of Finance, plans constructing public health projects at designated locations in republic. $2,500,000.

Mexico, Saltillo—City, Central Dpt., Saltillo, Coahuila, constructing city hospital, to Mario Pani, Saltillo, **$200,000.** Awarded 11/28. CD 2/24—ENR 3/4, under Mexico.

Mexico, Torreon—State of Coahuila, Dpt. Health, Torreon, hospital, to Pani & Antonpi, M. Pani, pres., Saltillo. **$175,000.** Awarded 11/28.

Venezuela—Office Ministerio de Obras Publicas Direccion de Vias de Communicacion, Caracas, receives bids January 3, 7 rein.-con. continuous girder type highway bridges, incl. approaches, culverts, dikes, slope protection, blankets, along Carretera Occidental between Ospino and Barinas, States of Portuguesa and Barinas. Extended date. Parsons, Brinckerhoff, Hogan & Macdonald, 142 Maiden Lane, New York, N. Y. and Calle Sur 17 No. 27, Caracas, engrs. CD 10/7—ENR 10/14.

PUBLIC BUILDINGS

PROPOSED WORK

†Ariz., Yuma—Pub. Housing Auth., 785 Market St., San Francisco, plans by H. O. Jaastad, 103 Miltenberg Pl., Tucson, 80 family dwelling units, Ariz. 2337, and 20 family trailers, Ariz. 2339; plans by Gilmore & Varney, 303 Luhrs Tower, Phoenix, 50 family dwelling units, Ariz. 2338. CD 12/3—ENR 12/9.

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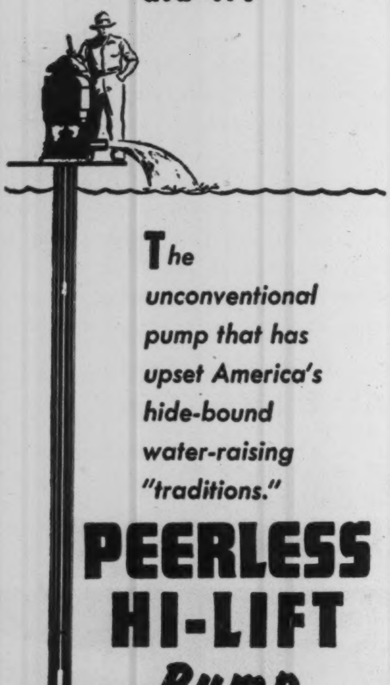

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

★ **†California**—Mohawk Petroleum Corp., 405 Montgomery St., San Francisco, addnl. facilities at plant, Kern Co. $1,000,000. Defense Plant Corp. will finance.

†Calif., Oakland—Home Owners' Loan Corp., 1440 Bway., Zone 12, plans by K. Ponsford, 900 Creed Rd., converting residence at 575 56 St., providing 4 living units for in-migrant war workers, Case No. W4B-1273. $8,000.

†Calif., Oakland—Home Owners' Loan Corp., 1440 Bway., Zone 12, plans by C. A. Whitehead, 5365 Broadway, converting lodge hall at 1424 94 Ave., providing 16 living units for in-migrant war workers, Case No. W4B-1139. $32,000.

†Conn., Groton—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., rebuilding fire damage, war housing, Conn. 6141.

†Conn., Windsor Locks—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., making plans garage-paint shop, Conn. 6081.

†Fla., Gainesville—Bd. Comrs. Alachua Co., child care facilities, $11,707, **FWA.**

†Fla., Pensacola—Federal Works Agency, 18 and F Sts. N.W., Wash., 25, D. C., bids soon hospital. $234,081.

†Fla., Tallahassee—City, child welfare facilities. $22,920, **FWA.**

†Ga., Brunswick—Federal Works Agency, 20 Fifth St., Atlanta, plans by Abreu & Robeson, 22 Marietta St. Bldg., Atlanta, 5 school bldgs., 2 fire stations, 1 U.S.O. bldg. CD 10/26—ENR 10/28.

†Ga., Columbus—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, plans by Lockwood & Biggers, Murrah Bldg., bids soon 120 permanent housing units, Ga. 4-5. CD 12/3—ENR 12/9.

†Ia., Iowa City—University of Iowa, nurses' training home at University Hospital, Ia. 13-503. $200,000. **FWA.**

†Kan., Junction City—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., plans by Spencer & Brink, Topeka, tenant activity bldg., Kans. 14011.

†Kan., Kansas City—Providence Hospital, c/o Sisters of Charity, 18 and Barnett Sts., Kansas City, Kan., plans by Carroll & Dean, R. A. Long Bldg., Kansas City, Mo., hospital addn., Kan. 14-148, $202,200. **FWA.**

†Kan., Wichita—Wichita Hospital, 1102 W. Douglas St., c/o Sisters of St. Joseph, Wichita, plans by Overend & Boucher, Brown Bldg., nurses' training home, Kan. 14-250. $196,000. **FWA.** CD 9/9—ENR 9/16.

†Ky., Henderson—Pub. Bldgs. Admin., 18 and F Sts. N.W., Wash., D. C., 25, Henderson Hospital, Ky. 15-113. **FWA.**

†La., Alexandria—Pub. Housing Auth., NHA, 1205 Electric Bldg., 7 and Taylor Sts., Fort Worth, Tex., plans by Barron & Heinberg, Guaranty Bank Bldg., 36 unit dormitory housing, La. 16097, and 35 unit family dwellings, La. 16098. CD 11/19—ENR 11/25.

†La., New Orleans—Pub. Housing Auth., NHA, 1205 Electric Bldg., 7 and Taylor Sts., Fort Worth, Tex., plans by Allison Owen & Goldstein Assoc., American Bank Bldg., 500 unit family dwellings, La. 16100. CD 11/23—ENR 12/2.

†La., New Orleans—U. S. Eng., 300 Bway., Little Rock, Ark., addnl. ordnance storage facilities, Sol. 03-050-44-27.

†Me., South Portland (br. Portland)—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., bids soon brick school for Mt. View Housing, Me. 17038. Miller & Beal, Inc., 465 Congress St., Portland, Me., and Desmond & Lord, 6 Beacon St., Boston, Mass., archts. H. E. Bailey, 177 State St., Boston, Mass., engr. CD 11/24—ENR 12/2.

†Md., Aberdeen—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., cancelled construction 24 unit dwellings, Md. 18275. F. L. W. Moehle, 312 Professional Bldg., Baltimore, archt. CD 12/29—ENR 12/2, under BA.

†Md., Elkton—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., rejected bids Dec. 1, child care building, Md. 18151. CD 11/26—ENR 11/11.

†Mass., Boston—St. Mary's Infant Asylum & Lying-In Hospital, 90 Cushing Ave., plans by T. F. McDonough, 168 Dartmouth St., hospital alterations, Mass. 19-185. **FWA.**

★ **†Michigan**—Continental Aviation & Engineering Corp., 12801 E. Jefferson St., Detroit, addnl. plant facilities, Muskegon Co. Approx. $40,000,000. Defense Plant Corp. will finance.

†Missouri — National Magnesium Casting Co., 2101 S. Jefferson St., St. Louis, plant facilities, St. Louis Co. $375,000. Defense Plant Corp. will finance.

†Missouri—U. S. Eng., 10 E. 17 St., Kansas City, Mo., 100x190 ft. gymnasium and ward bldg. at O'Reilly General Hospital, Greene Co.

Mo., Joplin—St. John's Hospital, 2203 Connor Ave., revised plans by Carroll & Dean, 1220 R. A. Long Bldg., Kansas City, hospital addn. $350,000. Applied for FWA funds. CD 11/8—ENR 11/11.

Mo., Springfield—H. B. Carr, mayor, City Hall, 60 bed modern city hospital. $150,000. Will vote bond issue April, 1944.

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

†**Miss., Pascagoula**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 720 unit family housing, Miss. 22177.

†**Mont., Great Falls**—Pub. Housing Auth., NHA, Skinner Bldg., Seattle, 1, Wash., plans by A. V. McIver, 512 Strain Bldg., 100 unit housing and 100 unit trailer housing, Wash. 42030 and 42031. CD 11/15—ENR 11/18.

†**Nev., Eureka**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, Calif., 40 unit family housing, Nev. 26160, and 30 unit family trailer housing, Nev. 26161, at Mount Hope, near here.

†**Nev., Pioche**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, Calif., plans by F. L. Confer, Financial Center Bldg., Oakland, Calif., 80 unit family housing, Nev. 26162. CD 12/3—ENR 12/9.

†**N. J., Burlington**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., 30 unit permanent family housing, N. J 20-2.

†**N. J., Dover**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., revised plans by S. Schenker, 195 Van Houten St., Paterson, commercial bldg., NJ 28101. CD 10/19—ENR 10/21.

†**N. J., Metuchen**—U. S. Eng., 120 Wall St., New York, 5, N. Y., addnl. proof firing bldg., at Raritan Arsenal.

†**New York**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Quonset Huts, Lido Beach. $170,000.

★†**Ohio**—Lake City Malleable Co., 5000 Lakeside St., Cleveland, plant facilities, Ashtabula Co. Approx. $3,360,000. Defense Plant Corp. will finance.

★**O., Euclid (br. Cleveland)**—Euclid Bd. Educ., Mrs. Alice M. Ressler, clk., 1520 Chardon Rd., Cleveland, plans by H. A. Fulton, 6014 Euclid Ave., Cleveland, brick, steel, concrete Central High School. $1,500,000.

★†**Oregon**—Columbia Metals Co., Securities Bldg., Seattle, Wash., plans by Chemical Constr. Co., engrs.-archts., 30 Rockefeller Plaza, New York, N. Y., alumina-bearing clay treating plant. $4,096,000. Defense Plant Corp. will finance. (**Correction**—Owner's address). CD 11/26—ENR 12/2.

★†**Pennsylvania** — Continental Distilling Corp., 1429 Walnut St., Phila., plant facilities. $2,000,000. Defense Plant Corp. will finance.

†**Pa., Danville**—George F. Geisinger Memorial Hospital, Danville, nurses' home and training school, Pa. 36-222. $184,830. **FWA.**

†**Pa., Hatboro**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., revised plans by Silverman & Levy, 1700 Sansom St., Phila., community bldg. and commercial bldg., Pa. 36251. CD 10/28—ENR 11/4.

†**Pa., Sharon and Farrell**—Pub. Housing Auth., NHA, 270 Bway., New York, 7, N. Y., indefinitely postponed bids to have been opened Nov. 15, 150 unit family dwellings, Pa. 20-1. CD 11/8—ENR 11/11.

Pa., Waynesburg—Greene Co. Memorial Hospital, J. T. Lindberg, supt., brick hospital addn. $200,000.

†**S. C., Florence**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 35 five room housing units. Over $200,000.

★†**Tenn., Memphis**—U. S. Eng., Grant St., west of Westwood St., Mobile, Ala., depot and yards. $500,000.

★†**Tex., Pasadena**—Defense Plant Corp., 811 Vermont Ave. N.W., Wash., D. C., addnl. refinery plant expansion. $2,100,000. Crown Central Petroleum Corp., Pasadena, and Esperson Bldg., Houston, will operate.

Alta., Calgary—Dominion Govt., c/o Ministry of Pensions & National Health, Ottawa, Ont., addnl. wing to Col. Belcher Hospital. $150,000. Dpt. P. Wks., Ottawa, Ont., archts.

†**Utah, Drager**—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., plans by Five Associates, engrs.-archts., Belvedere Hotel, Salt Lake City, 100 unit stop-gap housing, Utah, 42173. CD 11/15—ENR 11/18.

†**Va., Arlington**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., plans by R. F. Beresford and M. Rosenauer, 810 18 St. N.W., Wash., D. C., 130 unit family dwellings, Va. 11-1. CD 9/14—ENR 9/16.

†**Va., Norfolk**—Federal Works Agency, 606 State Planters Bank Bldg., Richmond, Zone 19, plans by V. A. Moore, Flatiron Bldg., hospital facilities. $120,000.

†**Va., Norfolk**—U. S. Eng., Fort Norfolk, Norfolk, housing facilities.

†**Wash., Seattle**—Seattle Housing Auth., 825 Yesler Way, plans by McClelland & Jones, Republic Bldg., administration, tenant activity bldg., for housing Wash. 45245; day care bldg. for Wash. 45248; plans by Jones, Thiry, Shay, 715 Hoge Bldg., Zone 4, 200 unit family dwellings, Wash. 45244, for NHA. CD 11/5—ENR 11/11.

†**Wis., Racine-Kenosha** — Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., plans by F. J. Hoffman, 503 Janes Bldg., Racine, 150 unit stop-gap housing, Wis. 47074. CD 11/15—ENR 11/18.

†**Wyo., Casper**—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., plans by L. C. Goodrich, Casper, 60 unit family dwellings, Wyo. 48087, and 100 unit stop-gap housing, Wyo. 48088.

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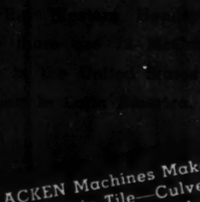

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

Ont., Toronto—Secy. Dpt. Munitions & Supply, Ottawa, Naval Training Sta., Fleet St. W., for Dpt. National Defense (Sea), Ottawa. $150,000.

Ont., Orillia—Dpt. P. Wks., Ottawa, made plans Ontario Hospital exten., incl. seven 1 story brick veneer, frame bldgs., concrete fdns. $383,000.

Sask., Onion Lake—Dominion Govt., c/o Ministry of Indian Affairs, Ottawa, Ont., residential school. $150,000.

BIDS ASKED

Bids Asked After December 10

†Pa., Uniontown—Fayette County Housing Auth., Uniontown, driveway and parking areas, Pa. 15-1, for NHA.

Bids Asked After December 15

†N. J., Perth Amboy—Perth Amboy Housing Auth., City Hall, yard drainage and rear walks, N. J. 6-1, for NHA. CD 11/26—ENR 12/2.

Bids Asked December 20

N. B., McGivney Junction—Secy. Dpt. Munitions & Supply, Ottawa, Ont., 9 storage magazines, roads, fences, for Dpt. Natl. Defense, (Army), Ottawa, Ont. $90,000.

Bids Asked After December 21

†N. J., North Bergen—North Bergen Housing Auth., North Bergen, sump pump pit, NJ 4-1, for NHA.

Bids Asked December 22

†Pa., Allentown—Allentown Housing Auth., Allentown, altering community bldg., Pa. 4-1, for NHA.

Bids Asked December 23

†Va., Norfolk—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., special commercial bldg., tenant activity bldg., child care bldg., Va. 44075. Extended date. A. M. Lublin, Dickson Bldg., archt. CD 11/26—ENR 12/2.

†Va., Portsmouth—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., tenant activity and child care bldg., for housing, Va. 44086. Williams, Coile & Pipino, Meison Bldg., Newport News, archts. CD 12/8.

†Wyo., Casper—Pub. Housing Auth., NHA, Dierks Bldg., 1006 Grand Ave., Kansas City, Mo., 60 trailer unit housing, incl. excav., grading, site imprvs., sewer and water utilities, etc., Project 48087. L. C. Goodrich, 226 E. 2 St., engr.-archt. CD 12/8.

†Mich., Muskegon—Pub. Housing Auth., NHA, 2073 E. 9 St., Cleveland, O., 100 unit temporary family dwellings, Mich. 20036. Plans deposit $50. Extended date. Harley, Ellington, 1507 Stroh Bldg., Detroit, archts. CD 11/10—ENR 11/18.

Bids Asked December 28

†Calif., Hunters Point—Federal Works Agency, 15 Shattuck Sq., Berkeley, Unit 1, 6 classrooms; Unit 2, 7 classrooms; Unit 3, 6 classrooms, Ridgepoint School and 13 classrooms, Candlestick Cove School, Calif. 4-538. Plans deposit $25, D. A. Riedy, City Hall, San Francisco, city archt. CD 10/11—ENR 10/14.

†Md., Aberdeen—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., 380 unit family housing, Md. 18267. Extended date. F. L. W. Moehle, 312 Professional Bldg., Baltimore, archt.

†Tex., New Boston—Pub. Housing Auth., NHA, 1205 Electric Bldg., Seventh and Taylor Sts., Fort Worth, 200 family dwelling units, Tex. 41-579. Plans deposit $50, Geo. L. Dahl, Southland Bldg. Annex, Dallas, archt. CD 5/27—ENR 6/10.

Bids Asked January 4

La., DeQuincy—Calcasieu Paris School Bldg., Courthouse Bldg., Lake Charles, 1 story, brick school. $150,000. Dunn & Quinn, Lake Charles, archts. CD 8/23.

Bids Asked January 5

B. C., New Westminster—Minister P. Wks., Parliament Bldgs., Victoria, remodeling Wards A, B, C and centre unit mental hospital, for Province of British Columbia, Parliament Bldgs., Victoria. $250,000. Plans deposit $25. H. Whittaker, Parliament Bldgs., Victoria, archt. CD 12/2—ENR 12/9.

Bids Asked January 15

†N. J., Long Branch—Pub. Housing Auth., 270 Bway., New York, 7, N. Y., 1 story, brick, administration, clinic and child care bldg. I. H. Brown, 191 Bway., archt.

†N. C., New Bern—Federal Works Agency, 606 State Planters Bank Bldg., Richmond, 19, Va., nurse's home for Good Shepherd Hospital for Negroes. $40,000. Tentative date. R. Fuson, New Bern, archt.

Bids Asked January 25

†O., Chillicothe—Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash., D. C., Acute Bldg. 210.

Bids Asked

†Miss., Meridian—Meridian Housing Auth., Meridian, housing facilities bldg. for NHA. Plans deposit $25. Krause & Brasfield, 204 Kidder Bldg., Meridian, archts.

†N. J., Jersey City—U. S. Eng., 120 Wall St., New York, 5, N. Y., standard gas equipment bldg. $20,000.

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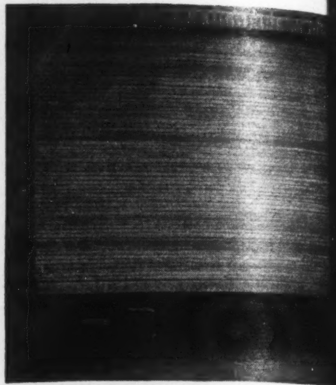

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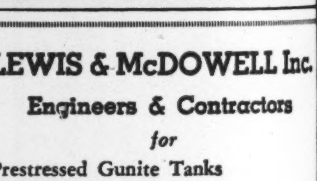

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UBLIC BLDGS. (Bids Asked, Cont'd.)

†Wis., **Sturgeon Bay**—Pub. Housing Auth., HA, 201 N. Wells St., Chicago, Ill., addns. to ousing Wis. 47022 and 47023. (T). Foeller, chober, Berners, Safford & Jahns, 310 Pine ., Green Bay, archts.

OW BIDDERS

†Calif., **Burbank**—Vega Aircraft Corp., 2555 Hollywood Way, 119x168 ft., wood frame, ucco assembly bldg., from McNeil Constr. ., 5860 S. Avalon Blvd., Los Angeles, approx. 0,000. Defense Plant Corp. will finance. onald B. Parkinson, 433 S. Spring St., Los ngeles, archt. CD 11/15—ENR 11/18.

†Calif., **Vallejo**—Housing Auth of City of allejo, Victory Apts., Ryder St., Dec. 9, 500 ormitories, Calif. 4768, for NHA, from Stolte, nc., 8451 San Leandro St., Oakland, Zone 3, 4,500. CD 11/30.

Ky., **Lexington**—W. P. Hogarty, dir. Div. urchase & Pub. Properties, 230 New State ffice Bldg., Frankfort, Nov. 30, reconstructg front portion male ward bldg. Eastern tate Hospital, from Skinner Bros., Lexingn, **$196,792.** CD 11/3—ENR 11/11.

†Mich., **Pontiac**—Pub. Housing Auth., NHA, 73 E. 9 St., Cleveland, O., Nov. 21, 100 it temporary family dwellings, Mich. 20219, om Brown & Mathews, Inc., 3-213 General otors Bldg., Detroit, Zone 2, **$339,853.** CD /9—ENR 11/11.

O., **Berea**—City, R. L. Kobie, dir. Pub. rvice, City Hall, Nov. 19, brick, rein.-con. unicipal light plant addn., from Schirmereterson Co., 6830 Beaver Ave., Cleveland, 5,300. Est. $80,000. CD 11/8—ENR 11/11.

†Wash., **Seattle**—Seattle Housing Auth., 825 esler Way, Zone 4, Dec. 1, 140 unit housing, aylor Ave., Wash., 45245, for NHA, from trand & Sons, 3935 University Way, Zone 5, 284,000. CD 11/22—ENR 10/28.

ONTRACTS AWARDED

†Calif., **Burbank**—Vega Aircraft Co., 2555 Hollywood Way, parts, bins, shelves in ldg. 85, to McNeil Constr. Co., 5860 Avalon lvd., Los Angeles, **$216,547.** Defense Plant orp. will finance. D. B. Parkinson, 433 S. pring St., Los Angeles, archt. CD 11/15—NR 11/18.

†Calif., **Oakland**—Home Owners' Loan Corp., 40 Bway., Zone 12, converting property at and Franklin Sts., providing 150 housing nits for in-migrant war workers, Case No. 4B-899, to B. Liebman. 3319 Fillmore St., n Francisco. Est. **$261,390.** CD 11/16—NR 11/18.

†Calif., **San Diego**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 600 mporary dwellings, Calif. 4797, to Gorelnik ., 1220 S. LaBrea Ave., Los Angeles, 1,283,534. Bids 11/19. CD 11/23—ENR 11/25, nder LB.

†Conn., **Bridgeport**—Pub. Housing Auth., HA, 24 School St. Boston, Mass., gas and atermain repairs, reconstruction Success ark housing, Conn. 6052, to Merritt Bldg. ., Inc., 74 Goodsell St., **$57,735.** Bids 12/10. D 12/3—ENR 12/9.

†Fla., **Panama City**—U. S. Eng., Grant St. est of Westwood St., Mobile, Ala., mess hall, creation bldg., hospital facilities, Ser. 226, The Jordan Co., Columbus, Ga., **$158,430.**

†Ga., **Dublin**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., C., central bldgs., U. S. Naval Hospital, pec. 11829, NOY 6948, to Hardaway Contg. ., 15 11 St., Columbus, Bid Items 1, 3 and 6, 1,096,000. CD 12/3, under LB.

†La., **New Orleans**—Pub. Housing Auth., NHA, 1205 Electric Bldg., 7 and Taylor s., Fort Worth, Tex., 500 unit family housg, La. 16099, to R. P. Farnsworth & Co., nc., 1515 S. Salcedo St., **$663,132.** Bids 11/30, warded 12/3. CD 12/7—ENR 12/9, under B.

†Mass., **Fort Devens**—U. S. Eng., 31 St. ames St., Boston, heating, ventilating sys., bldgs., No. 19-023-44-Neg 135, to Florence Co., 60 Mt. Vernon St., Reading, **$82,800.** ids 12/3.

†Mich., **Royal Oak**—N. A. Woodworth Co., oyal Oak, design and construction, brick, teel, concrete factory addn., to Austin Co., 29 Curtis Bldg., Detroit. Est. over **$50,000.** efense Plant Corp. will finance. CD 11/18—NR 11/25.

†N. J., **Jersey City**—U. S. Eng., 120 Wall St., ew York, 5, N. Y., warehouses, to P. J. arlin Constr. Co., 101 Park Ave., New York, . Y., **$160,000.**

†N. J., **Linden**—Eastern Aircraft, Div. General Motors, Edgar Rd., substructure and uperstructure, 1 story, 200x218 ft., rein.-con., rick, pre-flight hangar bldg., to Wm. Blanchrd Co., 45 Poinier St., Newark, **$60,000.** ederally financed.

†N. J., **Trenton**—Pub. Housing Auth., NHA, 70 Bway., New York, 7, N. Y., 120 unit housng, NJ 5-3, to Mutual Constr. Corp., 7 E. 2 St., New York, N. Y., **$439,168.** Bids 11/5. D 11/10—ENR 11/18 under LB.

†N. C., **Camp Sutton (P. O. Monroe)**—U. S. ng., Florence, S. C., addnl. barracks B-A-T-). No. 38-081-44-102, Neg., to M. B. ahn Constr. Co., 714 Lady St., Columbia, C., approx. **$150,000.**

†**Pennsylvania**—U. S. Eng., Standard Oil ldg., Baltimore, Md., 1 story, 64x528 ft., rame assembly bldg., Camp Reynolds, Mercer o., to P. W. Glenn, 17 S. Dock St., Sharon. ids 11/29. CD 11/24.

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PUBLIC BLDGS. (Contracts Awarded, Con.)

†**Pa., North Braddock**—Allegheny Co. Housing Auth., 201 County Office Bldg., Pittsburgh, site imprvs., incl. regrading, installing new surface drainage sys., drain inlets and addnl. storm sewers, paving existing parking areas, new lawns, Pa. 36201, for NHA, to Sankay Bros., Inc., 307 Law & Finance Bldg., Pittsburgh. **$171,000.** CD 11/11—ENR 11/18.

†**O., Toledo**—U. S. Eng., 522 U. S. Post Office & Courthouse, Cincinnati, addnl. heating facilities, Rossford Ordnance Depot, Contr. 33-015-Eng-145, to A. Bentley & Sons Co., 201 Belmont St., **$66,208.**

★†**Tex., Dallas**—Smaller War Plants Corp., M. R. Harrison, reg. dir., Santa Fe Bldg., furnishing prefabricated barracks, building units, to National Housing Co., 2310 Butler St., **$1,241,000** and to Texas Prefabricated House & Tent Co., 160 Avery St., **$368,640.**

★†**Tex., Galveston**—Pub. Housing Auth., NHA, 1205 Electric Bldg., Seventh and Taylor Sts., Fort Worth, 600 masonry units, Tex. 41615 and 41623, to Robert E. McKee, 1918 Texas Ave., El Paso, **$1,225,000.** Awarded 12/4. CD 12/7—ENR 12/9.

★†**Tex., Waco**—Veterans Admin., **Vermont** Ave. between H and I Sts. N.W., Wash., D. C., bldgs., Nos. 90, 91, 92 and 93, to Robt. E. McKee, 1918 Texas Ave., El Paso, **$1,483,000.** CD 12/9, under LB—ENR 11/4.

COMMERCIAL BUILDINGS

PROPOSED WORK

Neb., Omaha—Children's Memorial Hospital, 44 and Dewey Ave., hospital bldg. $200,000. CD 12/9, under Public Bldgs.

Pa., Sharon—Keystone Associates, J. Mittleman, chg., 1010 Arrott Bldg., Pittsburgh, eighty 2 story, bsmnt., 20x26 ft. brick, frame residences, $400,000.

Tex., Fort Worth—W. N. McCorstin, 4129 Curzon St., frame type dwellings, $150,000.

Tex., Houston—F. M. James, 5119 Linden St., frame dwellings, $150,000.

Tex., San Antonio—F. Robertson, 227 Cleverlief St., residential construction. $150,000.

★**Vt., St. Albans**—Kerbs Memorial Hospital, Inc., St. Albans, plans by **Voorhees, Walker, Foley & Smith, 101 Park Ave., New York, 17, N. Y.,** hospital and nurses **training** school and home. $600,000.

★**Wis., Kenosha**—Harris Homes, Inc., 111 W. Monroe St., Chicago, Ill., seventy-five 2 story, brick duplex houses, $900,000, FHA.

Wash., Seattle—Lagerquist Brothers, 12702 15 Ave. N.E., Zone 55, plans by Stuart & Durham, 4 & Cherry Bldg., Zone 4, 35 frame houses at W. 75 St. and 18 Ave. N.W. $175,000.

Ont., Trenton—General Hospital Bd., c/o W. H. Ireland, 7 Marmora St., hospital. $150,000.

Que., Montreal—Roman Catholic School Comn., Ste. Catherine St. W., plans by E. Larose, 1480 E. St. Joseph Blvd., normal school. $200,000.

BIDS ASKED

Tex., Galveston—H. T. Rogers, 4701 E. Sherman St., (selected bidders) 3 story masonry type hotel bldg. $150,000.

CONTRACTS AWARDED

★**Calif., Burbank** and **North Hollywood**—Jane Reed Kissinger, 4141 N. Lankershim Blvd., North Hollywood, 183 units (multiple dwellings) in Burbank and 87 single dwellings in North Hollywood. Owner builds. Over **$500,000.**

Conn., New Haven—L. Baron, 102 Chester St., Hamden, 3 brick garden type apartment bldgs., Putnam Ave. Owner builds, **$150,000.** E. C. Bradley, 302 Union Ave., West Haven, archt.

Tex., Dallas—Shadywood Development Co., Cedar Hill Rd., West Oak Cliff, one hundred ten 4 room frame type dwellings, facilities, outside utilities, etc. Owner builds, **$175,000.** CD 12/1—ENR 12/9.

★**Tex., Dallas**—A. P. Simons, 707 Liberty St., two hundred 1 story, 6 room brick veneer type dwellings, Davis St. west of Kessler Blvd., force account, **$1,000,000.** CD 12/2—ENR 12/9.

Tex., Fort Worth—Linwood Development Co., 2700 Merrimac St., forty 1 story, frame duplexes, concrete fdns., utilities, etc., to New River Lumber Co., 300 Carroll St., Houston, **$210,000.** CD 12/7—ENR 12/9.

Tex., Gainesville—W. E. Woods, 50 frame type, 5 room dwellings, force-account, **$225,000.** CD 12/3—ENR 12/9.

Tex., Pasadena—Brick Homes, Inc., Houston, sixty-one 1 story, hollow tile, stucco dwellings, to H. G. Copeland, 3057 Locke Lane, Houston, **$275,000.** J. Knostman, 2017 W. Gray St., Houston, archt.

Ont., Toronto—J. B. O'Brien Succession, c/o Molesworth & Secord, archts., 18 Toronto St., 5 story, film exchange bldg., to Dickie Constr. Co. Ltd., 17 Yorkville Ave. **$150,000.**

INDUSTRIAL BUILDINGS

PROPOSED WORK

Ill., East St. Louis—FACTORY—Aluminum Ore Co., 3300 Missouri Ave., bids soon 3 story, brick, concrete factory for aluminum oxide experiments, $300,000.

★**Ia., Cedar Rapids**—PLANT—Quaker
Co., 400 2 St. N.E., mfg. plant expans
Over $1,000,000.

N. Y., Brooklyn—FACTORY, etc.—Me
politan Engr. Co., 1250 Atlantic Ave., plans
F. D. Hutchinson, c/o owner, altering 4 st
brick factory and office bldg., 1236-1286
lantic Ave. $75,000.

Pa., Jeannette—PLANT—Pennsylvania
& Rubber Co., Jeannette, soon lets contr
1 story, 175x200 ft. rubber plant. Over $
000. Fletcher Thompson, Inc., 211 State
Bridgeport, Conn., engrs. CD 12/7—E
12/9.

Pa., Pittsburgh—FACTORY—E. L. Wieg
Co., A. P. Wiegand, pres., 7500 Thomas Bl
soon lets contract, 2 story, 85x85 ft., s
frame, face brick factory top addn. Pr
& Prack, 517 Martin Bldg., NS. archts.

R. I., Providence—PLANT—Federal Pr
ucts Corp., 1144 Eddy St., brick, steel, c
crete plant addn., incl. garage and load
platform. $40,000. Howe & Prout, 1
Turks Head Bldg., engrs.

Tex., Raymondville — WAREHOUSE — C
tral Power & Light Co., 205 N. 6 St., bids s
1 story brick, rein.-con., 100 ton capac
storage warehouse. Over $40,000.

Tenn., Selmer—FACTORY—Brown Shoe
Dyersburg, brick, concrete shoe facto
$50,000.

Tex., Carthage — PLANT—Arkansas-Lou
ana Gas Co., Marshall, Tex., and Slatt
Bldg., Shreveport, La., 25,000,000 cu. ft.
absorption type gasoline plant. $200,000.

Tex., Clodine—GRAIN STORAGE EL
VATORS—Hess Warming & Ventilating
c/o Bryce M. Hess, 1211 S. Western A
Chicago, Ill., rein.-con. grain storage
vator. $46,000.

Tex., Edroy—GRAIN STORAGE ELEVAT
—Hess Warming & Ventilating Co., B.
Hess, 1211 S. Western Ave., Chicago,
rein.-con. grain storage elevator. $40,000.

Tex., Goose Creek—GRAIN STORAGE EL
VATOR—Hess Warming & Ventilating
B. M. Hess, 1211 S. Western Ave., Chica
Ill., rein.-con. grain storage elevator. $40,0

Tex., Katy—GRAIN STORAGE ELEVATO
—Hess Warming & Ventilating Co., B.
Hess, 1211 S. Western Ave., Chicago,
rein.-con. grain storage elevators. $40,000.

Wis., Janesville—FACTORY, etc.—Schl
ter Dairy Supply Co., 320 N. Main St., pl
by Balch & Lippert, 16 N. Carroll St., Ma
son, 1 story, 69x125 ft., brick, block w
factory and shop addn.

N. B., Lameque—COLD STORAGE PLAN
etc.—Co-Op Association, Ltd., Lameque, c
storage and fish processing plant. $40,000.

Ont., Erieau—MACHINE SHOP, etc.—Good
son Fisheries, J. Cunningham and E. Carpe
ter, Erieau, machine shop, about $45,000;
frigeration plant for fishermen, about $45,0
drydock, about $60,000.

Ont., Simcoe—PLANT—Canners Machine
Ltd., 14 Sydenham St., plant reconstructi

Ont., Toronto — PLANT — Blairdon G
Mines, Ltd., c/o H. J. Martin, barrister,
Wendwer Rd., development plant and
sential bldgs. $50,000.

Ont., Wallaceburg—FACTORY—J. Eric Ma
Donald, Wallaceburg, 1 story, 60x120
brick, steel, glass factory. $50,000.

Ont., Wilberforce — FACTORY — Oakvi
Basket Co., Ltd., Oakville, 2 story facto
$40,000.

Que., Arntfield—MILL—Aldermac Min
Ltd., Dominion Square Bldg., Montreal, 2
ton mill and other bldgs., (lead, zinc a
copper concentrates). $70,000.

Que., Drummondville — POWER SUBST
TION—Canadian Celanese, Ltd., Drummon
ville, power substation. $81,240.

Que., Halet—PLANT—Aumaqua Gold Min
Ltd., Halet, diamond drilling and essent
mining development plant and bldgs. $50,0
J. P. Norrie, c/o Malartic Gold Field, Lt
P. O. Box 667, Montreal, engr.

Que., Montreal—SHOP—Giard, Ltd., 54
Resther St., blacksmith shop and other pla
extens., St. Hubert St.

Que., Montreal—PLANT—Island Industri
Ltd., 3930 E. Ste. Catherine St., plant ext

Que., Montreal—PLANT—Cartons, Ltd., 1
Grey Nun St., plant addn.

Que., Montreal — FACTORY — Successi
Loomis, c/o D. Loomis, Mount Royal Hot
factory. $100,000.

Que., Napierville—PLANT—St. Johns Sh
Mfg. Co., Ltd., St. Johns, plant.

Que., St. Bruno de Guigues—DAIRY—C
Op. Association Reg., c/o J. Meilleur, S
Bruno de Guigues, dairy and dairy produc
plants, cold storage plant. $40,000.

Que., St. Johns—PLANT—Singer Mfg. C
Ltd., 165 St. Paul St., plant addn.

Que., St. Sebastien—DAIRY—P. Charbo
neau, St. Sebastien, dairy, dairy produc
plant, ice house, etc. $50,000.

Que., Ste. Rosaline—PLANT—La Co-Oper
tive Federee of Quebec, Ste. Rosaline, pl
reconstruction. $100.000.

BIDS ASKED

O., Cleveland—LABORATORY—Alumin
Co. of America, A. R. Crow, supt. Constru
tion, 2610 Harvard Ave., 2 story, 101x171 f
brick, steel, concrete technical laborator
Malcomson-Calder & Hammond, Inc., 12
Griswold St., Detroit, Mich., archts.

NDUSTRIAL BLDGS. (Continued)

OW BIDDERS

Wis., Clintonville—FACTORY—Hansen Glove orp., 539 W. Wright St., Milwaukee, Dec. 6, story, 105x170 ft., brick factory bldg., conrete fdn., from Edw. H. Meyer Constr. Co., shkosh, **$59,844.** G. J. Feldhausen & G. C. onghlen, Green Bay, archts.

ONTRACTS AWARDED

Conn., East Hartford—FACTORY—Hamiln Standard Propeller Div., United Aircraft orp., 400 Main St., brick, steel gas chamber actory unit, to Wadhams, May & Carey Co., Lewis St., Hartford. Est. **$40,000.**

Neb., Omaha—TRUCK TERMINAL—Watson ros. Transportation Co., 802 South 14 St., ruck terminal, etc., to Peter Kiewit Sons Co., 24 Omaha National Bank Bldg. Est. **$250,-0-$300,000.** CD 11/22—ENR 11/25.

N. J., Bloomfield — PLANT — Westinghouse lectric & Gas Co., Maloney Bldg., Pittsurgh, Pa., mfg. plant bldg., to Frank Brise Co., Inc., 287 S. 19 St., Newark, **$50,000.** L. Heilman, Maloney Bldg., Pittsburgh, a., archt.

N. J., Jersey City—PLANT—Standard Heat- & Oil Equipt. Co., 245 Cornelison Ave., 1 ory, 60x160 ft. rein.-con. mfg. bldg., to B. Lucarelli & Son, 22 Orchard St., **$40,000.**

N. J., North Bergen—DAIRY, etc.—Hohneers Dairy, Inc., 807 74 St., 1 story, brick, rame dairy and 2 adjoining bldgs., to John arubbi Co., 147 64 St., West New York, **0,000.** L. Axt & F. Ricker, 6115 Hudson ve., West New York, archts.

N. J., Plainfield—INSPECTION AND DISRIBUTION—International Plainfield Motor o., 1449 Front St., 1 story, 78x242 ft., brick aterial inspection and distr. bldg., to Wigtonbbott Corp., 1225 South St., **$100,000.**

N. J., Woodbridge — WAREHOUSE — Jas. lein Co., 34 Main St., 2 story, brick on holw tile, feed and grain warehouse, to Walce Wilck Co., Inc., 280 Hobart St., Perth mboy, **$45,000.** L. Frank, 5 St., Fords, archt.

O., Akron—FACTORY—B. F. Goodrich Co., 0 S. Main St., 2 story, 60x80 ft., brick, eel, concrete factory addn., 1 story, brick se testing bldg., to H. L. Vokes Co., 5300 hester Ave., Cleveland. Est. **$42,000.**

O., Cleveland—FACTORY—Bailey Meter Co., S. Coffin, vice pres., 10o0 Ivanhoe Rd., 1 ory, 50x140 ft. and 114x160 ft., brick, steel ctory addn., to J. L. Hunting Co., 9th and hester Bldg. Est. **$40,000.** F. Haushka, nth and Chester Bldg., archt.

Pa., Pittsburgh—STORAGE and LOADING F. J. Kress Box Co., J. B. McClure, pres., 28 d AV RR, rebuilding 1 story, 230x240 ft. ructural steel storage and loading bldg., to e Trimble Co., 1719 Pennsylvania Ave. D 11/23—ENR 12/9.

R. I., Providence—MAINTENANCE and EPAIR—P. B. Mutrie Transportation Co., Tockwotten St., 1 story, 65x100 ft., brick, eel, concrete maintenance and repair bldg. dn., incl. extensive garage alterations, to ch Brothers Constr. Co., 424 Park Sq. dg., Boston, Mass. Est. **$75,000.** A. naselian, 8 Waldorf Rd., Newton, Mass., chts. Bids 12/2. CD 12/2—ENR 12/9.

Tex., Borger—PLANT—Phillips Petroleum Co., 404 N. Douglas St., Oklahoma City, la., and Bartlesville, Okla., new 100-octane soline plant, to L. O. Stocker Co., Borger, **50,000.**

Tex., Houston — MECHANICAL SHOP — ornhill-Craver Co., 1701 Lockwood Dr., 1 ory, 80x160 ft., steel frame mechanical shop g. for heavy equip., to Wm. A. Brunet, Shell Bldg., approx. **$40,000.**

Tex., Trinidad—PLANT—Lone Star Procing Co., 1915 Wood St., Dallas, gasoline nt expansion for manufacture components d in Aviation fuel and synthetic rubber. ner builds. **$175,000.** CD 12/2—ENR 12/9.

Wis., Manitowoc—WAREHOUSE—Lakeside cking Co., 508 Jay St., 1 story, 135x150 ft., el, brick warehouse, concrete fdn., to Kas- r Constr. Co., 1203 N. 16 St. P. Brandt, mpsey Bldg., archt. CD 11/23—ENR 12/9.

Wis., Green Bay—FREIGHT DEPOT AND RNTABLE—Chicago, Milwaukee, St. Paul Pacific R.R. Co., W. H. Penfield, ch. engr., ion Station, Chicago, Ill., freight depot eration, new turntable, own forces, **$40,000.**

Wis., Menasha — WAREHOUSE — John range Paper Co., Menasha, 1 story, bsmnt., x214 ft., concrete, steel warehouse, to Fluor os. Constr. Co., 48 Otter St., Oshkosh. CD /4—ENR 11/11.

Wis., Racine—FACTORY—Wisconsin Screw ., 21 St. and C. & N. W. R.R., 2 story, x82 ft., brick, concrete blocks, timber facy addn., to Nelson & Co., Inc., 1550 York E. A. Klinger, 614 14 St., archt.

Ont., Malton (toronto)—BOILER ROOM ALRATIONS—Victory Aircraft Ltd., Malton, ering boiler room at plant, to Milne & cholls, Ltd., 57 Bloor St., W., Toronto, ,000.

Que., Drummondville — PLANT — P. J. Wright, purch. agt., Canadian Celanese d., 1401 McGill College Ave., Montreal, 1 ry, 157x294 ft. and 4 story, 75x150 ft., ck, frame plant bldgs., rein.-con. fdns., to wart Constr. Co. Ltd., 70 Dufferin Ave., erbrooke. Est. **$500,000.** CD 11/18—ENR 25.

*Proposal **Advertisements see p. 178***
Postwar Projects see p. 154

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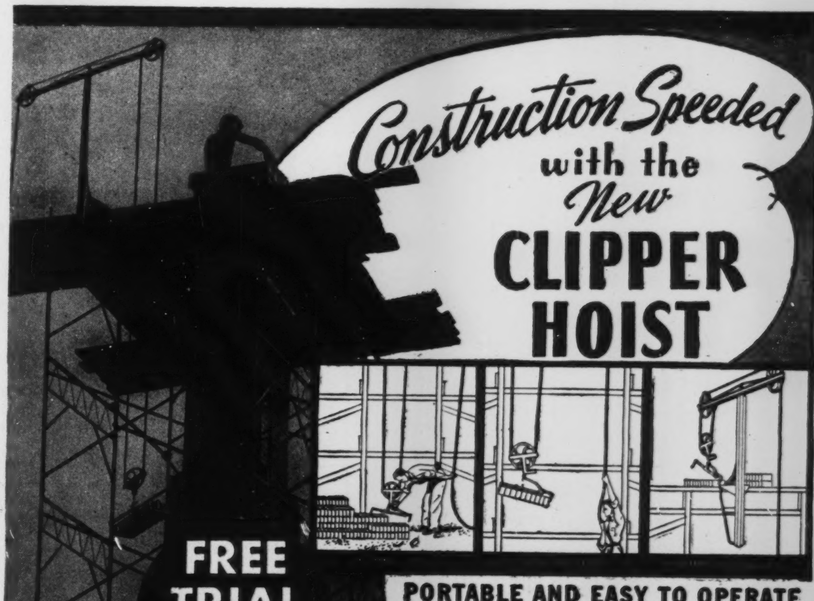

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OFFICIAL PROPOSAL

Bids: December 23, 1943 (206)

Water Street Trunk & Storm Sewers

FEDERAL WORKS AGENCY
PROJECT NO. CONN. 6–107
CONTRACT NUMBER NINE
CITY OF BRIDGEPORT

Sealed bids for General Construction of Water Street Trunk and Storm Sewers consisting of 2600 feet of 54″ Trunk Sewer, 2900 feet of Storm Sewers and all appurtenances will be received by Fred Schwarzkopf, Clerk of the Highway Committee of the City of Bridgeport, Connecticut in the City Hall, Bridgeport, Connecticut, until 2:00 o'clock P. M. (E.W.T.) December 23, 1943 and then at said office publicly opened and read aloud.

The Information for Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Performance Bond may be examined at said office and copies thereof obtained upon payment of *$10.00* for each set. Any bidder, upon returning such set promptly and in good condition, will be refunded his payment, and any non-bidder upon so returning such a set will be refunded *$5.00*.

The HIGHWAY COMMITTEE OF THE CITY OF BRIDGEPORT reserves the right to waive any informalities in or to reject any or all bids.

Each bidder must deposit with his bid, security in the amount of 10% of the amount of bid in the form and subject the conditions provided in the Informati for Bidders.

Attention of bidders is particularly cal to the requirements as to conditions employment to be observed and minim wage rates to be paid under the contra

No bidder may withdraw his bid within days after date of the opening thereof.

Envelopes must be plainly mark "Water Street Sewer Bid."

FRED SCHWARZKOPF, CLERK OF
THE HIGHWAY COMMITTEE OF TH
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December 6, 1943

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